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WASTE SOURCE AND WATER QUALITY SURVEY, PERDIDO BAY AND TRIBUTARIES, ALABAMA-FLORIDA

J. S. Hall, et al

Environmental Protection Agency
Athens, Georgia

August 1972

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REPORT TO THE CONFEREES OF THE SECOND SESSION
(PROGRESS MEETING) OF THE CONFERENCE IN THE MATTER
OF POLLUTION OF THE INTERSTATE WATERS OF
PERDIDO BAY AND ITS TRIBUTARIES
FLORIDA AND ALABAMA

WASTE SOURCE AND WATER QUALITY SURVEY
PERDIDO BAY AND TRIBUTARIES
ALABAMA-FLORIDA

August 1972

Environmental Protection Agency
Surveillance and Analysis Division
Athens, Georgia

The planning and operation of this project was carried out under the supervision of B. H. Adams, Chief, Engineering Services Branch.

Mr. J. S. Hall was Project Engineer and principal author of the report.

All Environmental Protection Agency personnel are assigned to the Surveillance and Analysis Division located at Athens, Georgia. The Division is under the direction of J. A. Little.

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INTRODUCTION

This report presents the results of a 10-day waste characterization and water quality study conducted by the Environmental Protection Agency during June 1972. The report specifically characterizes and quantifies the wastes discharged into upper Perdido Bay and its tributaries and assesses the waste's effects on receiving streams. The study, requested by the conferees at the Perdido Bay Federal-State Enforcement Conference Progress Meeting held in Gulf Breeze, Florida, during January 1972, presents the results with regard to the enforcement conference recommendations and compares study results with previous Federal findings.

Special acknowledgment is given to the personnel of the Pensacola District Office of the Florida State Board of Health for providing laboratory space.

FINDINGS

1. Waste loads enter Perdido Bay via Elevenmile Creek, Perdido River, and Bayou Marcus Creek. The total loads from each waterway and the percent of total contribution to the bay were:

	Elevenmile Creek		Perdido River		Bayou Marcus Creek	
	Load	Percent	Load	Percent	Load	Percent
Biochemical Oxygen Demand (Five Day)	4,100	69	1,530	26	320	5
Total Organic Carbon	29,100	86	4,400	13	470	1
Total Suspended Solids	5,700	24	15,600	73	530	3
Lignin-like Compounds	17,400	97	610	3	--	--

2. Nitrogen, phosphorus, TOC, and total coliform concentrations were above background levels in the upper portion of Perdido Bay, but severe water quality degradation was not apparent.

3. Total Kjeldahl nitrogen (TKN) concentrations above background (0.19 mg/l) were observed in the majority of the upper portion of Perdido Bay. Elevated TKN concentrations observed in the north and northeast sections of the bay were associated with discharges from Elevenmile Creek; those found in the southeast section were from Bayou Marcus Creek discharges, and those along the western shore were from the Perdido River. TKN concentrations near the mouth of Elevenmile Creek have decreased from 0.7 mg/l in September 1969 to 0.3 mg/l in 1972.

4. Phosphorus concentrations in the upper portion of Perdido Bay have not changed in the past three years. The highest concentration (0.05 mg/l) found in the northeast section of the bay in 1972 was associated with discharges from Elevenmile Creek. Concentrations ranging from 0.04-0.05 mg/l were found near the mouth of Bayou Marcus Creek.

5. Total organic carbon concentrations in Perdido Bay were primarily associated with discharges from Elevenmile Creek. Concentrations in the bay decreased progressively from 8 mg/l near the mouth of Elevenmile Creek to 4 mg/l near the U. S. Highway 98 bridge.

6. Total coliform bacteria discharges from Elevenmile Creek had the most noticeable effect on Perdido Bay. The densities gradually decreased from a mean of 490/100 ml in the upper bay to 35/100 ml in the lower portion of the bay. Florida's total coliform criteria of a monthly average not greater than 1,000/100 ml or an individual sample not exceeding 2,400/100 ml for Class III waters (associated with body contact activities) were violated near the mouth of Elevenmile Creek. The arithmetic average at the station near the creek mouth was 1,300/100 ml, and the maximum individual daily measurement was 4,300/100 ml.

   The National Shellfish Sanitation Program's limit of 70 total coliforms/100 ml was not met in the upper portion of the bay. Fecal coliform bacterial densities were less than 35/100 ml at every bay station.

7. Elevenmile Creek was the major contributor of lignin-like compounds to Perdido Bay. Concentrations of lignin-like compounds exceeded background levels of 0.4 mg/l in the upper portion of the bay. Concentrations ranged from 2.7 mg/l near the mouth of Elevenmile Creek to 0.8 mg/l at the U. S. Highway 98 bridge. Concentrations were reduced to background levels two miles below the U. S. Highway 98 bridge.

8. Color distribution over the bay paralleled lignin-like compound concentrations with the range from 67 platinum cobalt units near the mouth to 21 units below the U. S. Highway 98 bridge. Concentrations of lignin-like compounds and color of the bay water have decreased since 1969.

9. Dissolved oxygen ranged from 6.4 to 7.4 mg/l throughout Perdido Bay with the lower values occurring in the vicinity of Elevenmile Creek. Florida and Alabama's dissolved oxygen criteria of 4 mg/l were not violated.

10. Foam was never observed in Perdido Bay during the survey. However, foam was present in the St. Regis Paper Company's mill wastewater treatment system and in Elevenmile Creek immediately downstream from the discharge.

11. The St. Regis Paper Company mill at Cantonment, Florida, is responsible for almost 100 percent of the waste load in Elevenmile Creek and is the major waste contributor to Perdido Bay. Survey

results showed that Eightmile Creek, land runoff, and the Escambia County dump were insignificant contributors of wastes to Elevenmile Creek. Wastewater reductions and discharges at the Pensacola Mill were:

Parameter	Percent Reduction	Discharge
BOD_5	91	4,100 lbs per day
TOC	49	29,100 lbs per day
COD	52	84,000 lbs per day
Suspended Solids	88	5,700 lbs per day
Lignin-like Compounds	11	17,400 lbs per day
Color	15	1,100 Pt. Co. Units
Total Nitrogen	--	1,084 lbs per day
Total Phosphorus	--	220 lbs per day
Total Coliform	37	12,000/100 ml
Fecal Coliform	71	230/100 ml

Nitrogen and phosphorus, added to assist biological treatment, were not completely utilized. Excessive nutrient discharges which were measurable in Perdido Bay could cause over-enrichment.

12. The St. Regis Paper Mill is complying with enforcement conference BOD_5 requirements of not more than 51,000 pounds per day before treatment, 90 percent treatment reduction, and not more than 5,100 pounds per day in the final discharge.

13. Lincoln Park Subdivision, located north of Pensacola, discharged 80,000 gallons per day of treated wastewater into Eightmile Creek, a tributary to Elevenmile Creek. Ninety percent of the BOD_5 and suspended solids were removed. Chlorination equipment was inoperative, and the discharge contained high total and fecal coliform bacterial densities of 18,000,000/100 ml and 4,100,000/100 ml, respectively.

14. Leachate from the Escambia County dump located adjacent to Elevenmile Creek was not detectable in the creek.

15. Paper mill wastes in Elevenmile Creek interfered with the dissolved oxygen analyses, and data are not reported.

16. The flow, type treatment, and percent BOD_5 and suspended solids removals from each waste source discharging into Bayou Marcus were:

Waste Source	Flow (MGD)	Type Treatment	Percent Reduction	
			BOD_5	Suspended Solids
May Fair (Subdivision), Pensacola	0.085	Secondary	<60	69
Montclair (Subdivision), Pensacola	0.58	Secondary	70	76
Fairway Mobile Home Park, Pensacola	0.017	Secondary	44	62
Avondale (Subdivision), Pensacola	0.46	Secondary	<70	42

Montclair and Avondale plants were hydraulically overloaded. In spite of chlorination which produced chlorine residuals greater than 1 mg/l, Fairway Mobile Home Park was discharging excessive total and fecal coliform bacterial densities -- 73,000 and 20,000/100 ml, respectively.

17. Saufley Field (U. S. Navy) discharged 0.16 MGD of secondary treated wastewater into Perdido Bay through a 4,500-foot ditch.

18. The following discharges to Perdido River tributaries were investigated:

Discharger	Receiving Stream
Atmore	Boggy Branch
Robertsdale	Rock Creek
Bay Minette	Hollinger Creek
Newport Division, Tenneco Chemicals, Inc.	Hollinger Creek
Baldwin Pole and Piling Company	McCurtin Creek

Robertsdale provided 95 percent BOD_5 and 87 percent suspended solids reductions. Atmore provided 84 percent and 77 percent BOD_5 and suspended solids reductions, respectively. Bay Minette was by-passing at the time of the survey; however, the plant has been placed back into service. Construction of an oxidation pond system to serve Bay Minette began September 1, and is scheduled to be complete in three months. The discharges from these Alabama municipalities lowered the quality of receiving waters. However,

because of the distance to Perdido Bay (greater than 50 miles from Bay Minette and Atmore and about 25 miles from Robertsdale), the waste discharges were not detectable in the bay.

Tenneco provided sedimentation and biological treatment; the loads discharged were significant (BOD_5 - 440 pounds per day; COD - 1,960 pounds per day; total solids - 1,600 pounds per day). Tenneco proposes to expand their treatment system to provide physical-chemical treatment and then discharge to Bay Minette's oxidation ponds.

Baldwin provides only sedimentation, but because of the low flow (2,000 gpd), the BOD_5 and COD loads of 1 and 3 pounds per day, respectively, were negligible. However, several toxic phenolic compounds were being discharged.

19. Perdido River water quality at Florida Highway 184 bridge was indicative of unpolluted conditions and, generally, of better quality than the bay. However, because of the flow (285 cfs), the river is a significant contributor of pollutants to the bay.

20. During flood tide, Perdido River flow dispersed primarily southerly along the western shore of the bay; some flow moved easterly along the northern portion of the bay and mixed with water from Elevenmile Creek.

RECOMMENDATIONS

1. Nitrogen and phosphorus discharges from St. Regis and the five domestic wastewater treatment plants in western Pensacola should be reduced or eliminated.

2. The Florida Department of Pollution Control should monitor the dissolved oxygen in Elevenmile Creek to determine compliance with water quality standards.

3. The five sewage treatment plants in western Pensacola should be consolidated into a central facility or pumped to the city's main wastewater treatment plant. (A similar recommendation was made during the first enforcement conference in January 1970, but apparently no positive action has been taken.)

4. Baldwin Pole and Piling Company in Bay Minette, Alabama, should provide treatment to remove the phenols and other toxic substances now being discharged.

PREVIOUS FEDERAL INVESTIGATIONS AND ENFORCEMENT ACTION

The first Federal Water Pollution Control Administration[1/] water quality study of Perdido Bay was conducted during September 1969, at the request of the Director, Technical Staff, Alabama Water Improvement Commission. The study report concluded that wastes from the St. Regis Paper Company at Cantonment, Florida, adversely affected Perdido Bay, Perdido River, and Elevenmile Creek, and that water quality problems in the mouth of Bayou Marcus were caused by collective discharges from small sewage treatment plants.(1) The report recommended a water quality management and waste abatement program to include St. Regis and the sewage treatment plants. All waste abatement facilities were to be operational by January 1, 1973.

In January 1970, the report was presented [illegible]he Federal-State Perdido Bay Enforcement Conference. With minor changes, the report recommendations were adopted by the conferees.

A second wastewater survey of the Pensacola Mill, conducted in November 1970, established representative values of average mill discharges and evaluated the strength of certain process wastes generated within the mill. This report (2) concluded that the mill was generating an excessive amount of wastes as compared to average Southern Kraft mill operations and recommended that:

1/ Now the Environmental Protection Agency.

- Generated BOD_5 waste not exceed 51,000 pounds per day;
- Overall removal efficiency be 90 percent for carbonaceous waste material, and
- The daily allowable BOD_5 waste load discharged into Elevenmile Creek be reduced from 8,800 pounds per day to 5,100 pounds per day.

The second session of the enforcement conference was held during February 25-26, 1971. The conferees concluded that water quality degradation in Perdido Bay had continued since the first session and the progress toward reducing waste discharges had not been satisfactory. The conferees then recommended the BOD_5 revisions proposed in the Federal report.

A progress evaluation meeting was held during January 26-27, 1972. The conferees reviewed progress being made toward consolidation of sewage treatment facilities discharging into Bayou Marcus Creek and recognized improved treatment at St. Regis. However, the following recommendations were proposed:

- St. Regis shall reduce carbonaceous organic materials and color to the maximum degree feasible with special emphasis on the reduction of these materials in the bleachery wastes.
- The Environmental Protection Agency and the State of Florida shall make in-plant investigations of treatment processes and other pollution control measures employed by St. Regis to determine waste reductions being achieved by the company and the effects on receiving waters.

Special attention will be directed to the extent of the reduction of foam-causing constituents resulting from in-plant process changes and the installation of a secondary treatment system. In addition, any other waste source discharging into Perdido Bay or its tributaries shall be investigated.

STUDY AREA

The Perdido River Basin includes the eastern half of Baldwin County, Alabama, a small portion of southwestern Escambia County, Alabama, and the western portion of Escambia County, Florida (Figure 1). The Perdido Bay drainage basin has an area of 1,134 square miles, of which, approximately 786 square miles are in Alabama.

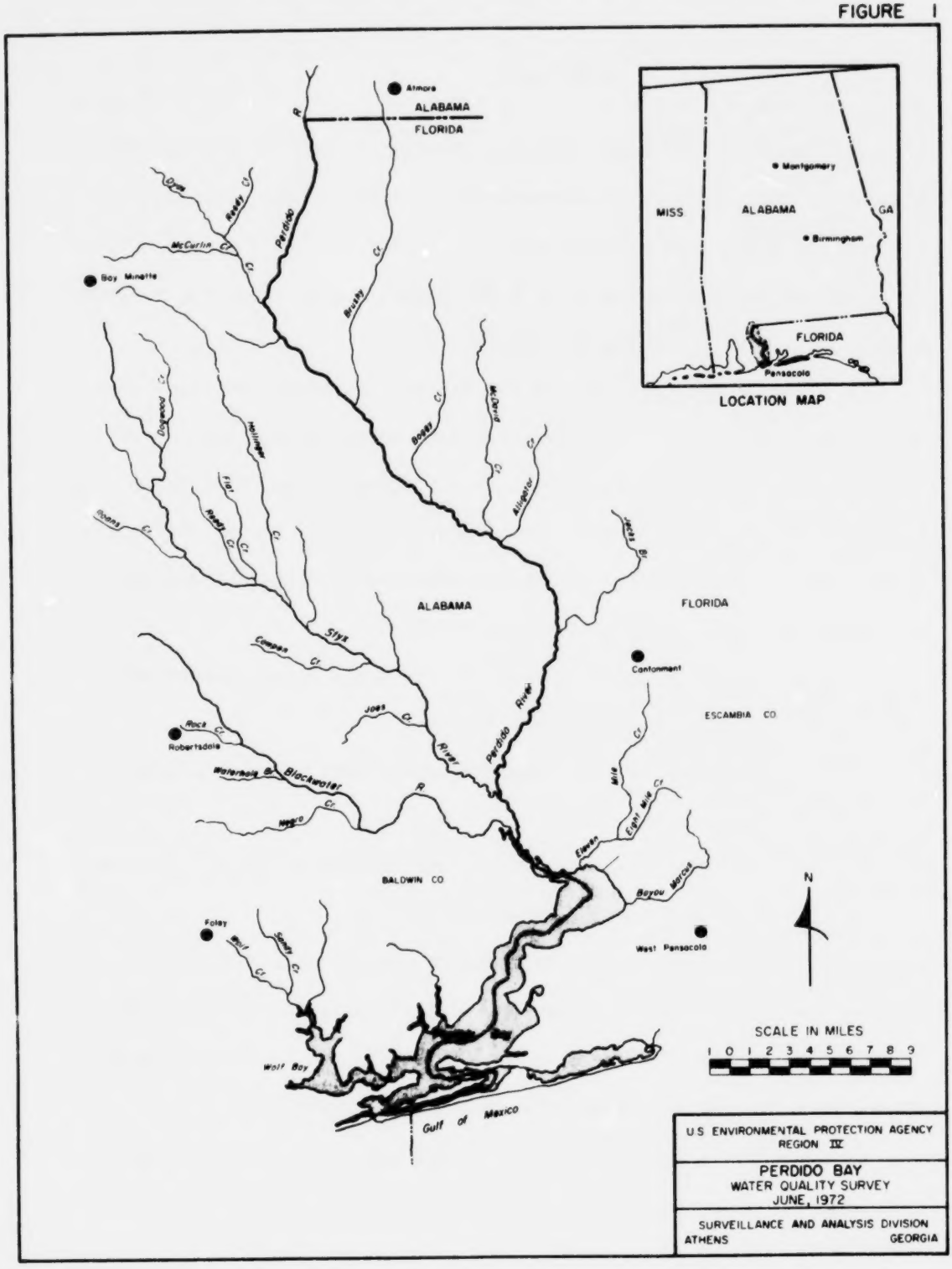
The Perdido River rises near Bay Minette, Alabama, and flows in a southerly direction for about 60 miles before discharging into Perdido Bay. The main tributaries are Dyas Creek, Brushy Creek, Styx River, and Blackwater River. Styx River, the largest tributary, drains 250 square miles. Other upper Perdido Bay tributaries are Elevenmile Creek and Bayou Marcus Creek. Elevenmile Creek receives:

- Treated wastewater from the St. Regis Paper Company mill located at Cantonment, Florida;
- Drainage from the Escambia County dump located adjacent to the creek, and
- Flow from Eightmile Creek, which drains a sparsely-populated area northwest of Pensacola.

During dry weather, wastewater from the St. Regis Paper Mill constitutes most of the flow in the upper reaches of Elevenmile Creek. Bayou Marcus Creek drains residential areas west of Pensacola and receives treated wastes from four municipal wastewater treatment plants.

Perdido Bay is two to three miles wide and approximately 15 miles long from the upper bay to the mouth on the Gulf of Mexico. The upper

FIGURE 1


Atmore
ALABAMA
FLORIDA
Perdido R.
Bay Minette
McCurtin Cr.
Beaty Cr.
Bushy Cr.
Boggy Cr.
McDavid Cr.
Alligator Cr.
Jacks Br.
Hollinger
Fish
Beaty Cr.
Styx
Compass Cr.
Joes Cr.
Perdido River
Robertsdale
Rock Cr.
Blackwater R.
Myers Cr.
Elevas
Eight Mile Cr.
Mile Cr.
Bayou Marcus
Foley
Sandy Cr.
Wolf Bay
Gulf of Mexico
Cantonment
West Pensacola
BALDWIN CO
ESCAMBIA CO
ALABAMA
FLORIDA
MISS
GA
Montgomery
Birmingham
Pensacola
LOCATION MAP
N
SCALE IN MILES
1 0 1 2 3 4 5 6 7 8 9
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PERDIDO BAY
WATER QUALITY SURVEY
JUNE, 1972
SURVEILLANCE AND ANALYSIS DIVISION
ATHENS GEORGIA

bay, north of the U. S. Highway 98 bridge, averages less than seven feet deep; the lower bay averages nine to ten feet. The entire bay, lower Perdido River, and other bay tributaries are subject to tidal variation. The constricted entrance to the bay impairs flushing within the bay.

The Perdido Basin population is about 95,000. Major populated areas are Atmore, Bay Minette, Foley, and Robertsdale, Alabama, and the western portion of Pensacola and Cantonment, Florida. Much of the basin is sparsely populated and forested. Rural unforested land in the lower basin is agricultural.

Three municipal sewerage systems in Alabama and six in Florida discharge wastewater into the Perdido Drainage Basin. Except for Bay Minette, Alabama, all municipalities are providing secondary wastewater treatment; Bay Minette has a primary plant which was bypassing during the study period (Table I). Atmore, Alabama, and all of the Florida systems discharge into interstate waters.

Three industrial waste point sources discharge into the Perdido drainage basin (Table II). The principal source is the St. Regis Paper Company's mill at Cantonment, Florida, which discharged 29 MGD of treated pulp and paper wastes into Elevenmile Creek. Other sources are Tenneco Chemicals and Baldwin Pole and Piling located at Bay Minette.

The area climate is mild. Summer temperatures average 80°F; winter temperatures average 55°F. Annual rainfall averages 62 inches. March, July, August, and September are the wettest months; October and November are the driest. High intensity thunderstorms are common with three to four inches of rain falling in one hour.

TABLE I

PERDIDO BASIN MUNICIPAL DISCHARGERS

Discharger	Treatment	Receiving Stream
Atmore, Alabama	Secondary (trickling filter)	Brushy Creek
Bay Minette, Alabama	Primary	Hollinger Creek
Foley, Alabama	Secondary (oxidation pond)	Wolf Creek
Robertsdale, Alabama	Secondary (aeration)	Rock Creek
Avondale subdivision Pensacola, Florida	Secondary (aeration)	Bayou Marcus Creek
Fairway Mobile Home Park Pensacola, Florida	Secondary (aeration)	Bayou Marcus Creek
Lincoln Park subdivision Pensacola, Florida	Secondary (aeration)	Eightmile Creek to Elevenmile Creek
May Fair subdivision Pensacola, Florida	Secondary (trickling filter)	Bellshead Creek to Bayou Marcus Creek
Montclair subdivision Pensacola, Florida	Secondary (aeration)	Bayou Marcus Creek
Saufley Field (Navy) Pensacola, Florida	Secondary (trickling filter)	Perdido Bay

TABLE II

PERDIDO BASIN INDUSTRIAL DISCHARGERS

Discharger	Treatment	Receiving Stream
St. Regis Paper Company Cantonment, Florida	Secondary (aeration and settling)	Elevenmile Creek
Tenneco Chemicals Bay Minette, Alabama	Secondary (biological)	Hollinger Creek
Baldwin Pole & Piling Bay Minette, Alabama	Settling Basin	Ditch to McCurtin Creek

During the study period (June 5-16), the weather was hot and generally clear with occasional afternoon thunderstorms scattered throughout the basin. Although 0.4 inches of rain was measured in Pensacola, only a trace amount of precipitation occurred at the paper mill. Temperatures ranged from 70-95° with daily averages from 75-85°F. Wind velocities varied from zero to gusts up to 35 MPH; direction was primarily from the north and east. The weather was clear during most of the early part of the survey; however, during the last few days of the survey, cloud cover was 100 percent.

Flow in the Perdido River at Barrineau Park averaged 285 cfs, which is normal for June. During the September 1969 survey, the average flow at Barrineau Park was 332 cfs. The ten-year, 7-day low flow for the period of record, 1942-1969, at this station is 222 cfs.

WATER QUALITY STANDARDS

Interstate waters in the study area are Perdido Bay, Perdido River, Brushy Creek, Elevenmile Creek, Eightmile Creek, and Bayou Marcus Creek. Perdido Bay and River are interstate boundary waters between Alabama and Florida; Brushy Creek flows across the state line; Elevenmile Creek, Eightmile Creek, and Bayou Marcus Creek are Florida coastal waters and tributaries to Perdido Bay.

Alabama classified Perdido Bay for swimming, shellfish harvesting, and fish and wildlife uses. Perdido River and Brushy Creek are classified for fish and wildlife uses only. Florida classified Perdido Bay, Perdido River, Bayou Marcus Creek, Eightmile Creek, and Brushy Creek as Class III waters -- waters suitable for recreation and the propagation and management of fish and wildlife. Elevenmile Creek was classified by Florida as Class V waters -- waters suitable for navigation, utility, and industrial use. Table III shows a summary of the water quality criteria presently adopted by Alabama and Florida.

Table III

Alabama and Florida Water Quality Criteria
Perdido Basin Use Classifications

Criteria Item*	Alabama			Florida	
	Swimming	Shellfish Harvesting	Fish & Wildlife	Class III	Class V
Temperature	Max. 93°F (Not more than 10% increase above ambient)			Insufficient to damage aquatic life, vegetation, or interfere with classified use	Not specified
Dissolved Oxygen	$\geq$ 4.0 mg/l	$\geq$ 4.0 mg/l	$\geq$ 4.0 mg/l	$\geq$ 4.0 mg/l	Not less than 1.0 mg/l (ave. value $\geq$ 2.0 mg/l)
pH	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5	6.0 to 8.5	5.0 to 9.5 (swamp waters to 4.5)
Bacterial	Monthly ave. 1000/100 ml (May-Sept.)	Not exceed PHS limits	Not specified	Monthly ave. 1000/100 ml daily value 2400/100 ml	Not specified
Turbidity	NOT SPECIFIED			$\leq$ 50 JTV above background	Not specified
Toxic substances	Free from substances which render water unsuitable for water contact sports	$\leq$ 1/10 48 hr. TLM	$\leq$ 1/10 48 hr. TLM	Free from substances toxic or harmful to humans, animals, or aquatic life	Not specified
Taste, Odor & color producing substances	Included w/toxic substances	No amount that will injure aquatic life, impair marketability or palatability or unreasonably affect aesthetic use value.		No amount sufficient to create a nuisance.	No amount that will interfere with classified use.

DISCUSSION OF STUDY RESULTS

STUDY PROGRAM

To comply with recommendations of the January 1972, Perdido Bay Enforcement Conference Progress Meeting, a field survey was conducted during June 5-16, 1972. The survey was designed to characterize all wastes discharging into Perdido Bay and its tributaries, determine the effects of discharges on receiving streams, and document foam-causing constituents in Perdido Bay and in discharges into the bay.

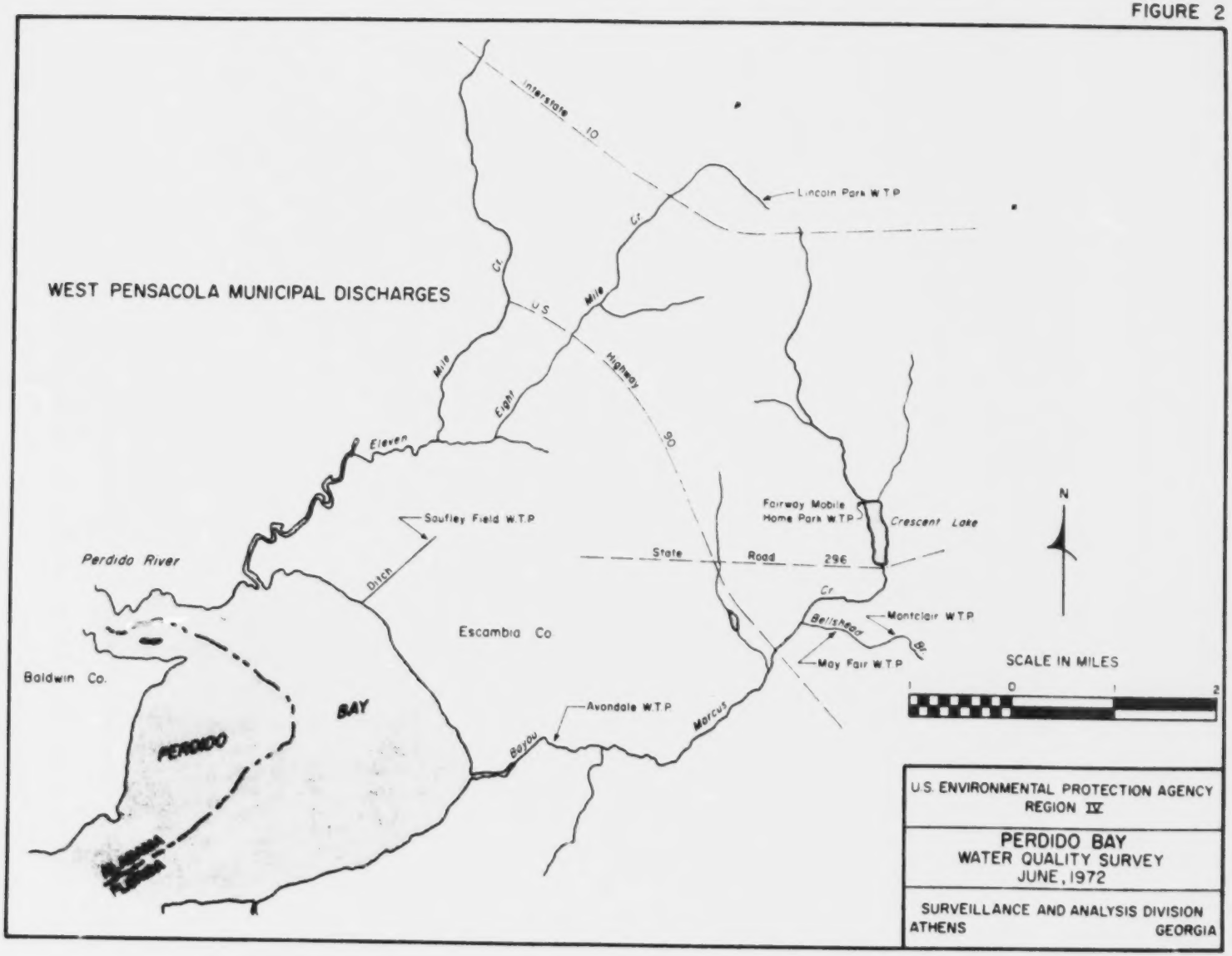
Influent and effluent samples were collected at each unit within the St. Regis Paper Mill wastewater treatment system and at each municipal wastewater treatment system. Effluent samples were also collected from Tenneco and Baldwin Pole and Piling Company in Bay Minette, Alabama. Flows were obtained at all waste sampling locations. Samples were also collected from Perdido Bay, Perdido River, Elevenmile Creek and Bayou Marcus Creek. Sampling location descriptions and required analyses are listed in the respective sections of this report. All analyses were conducted in accordance with Standard Methods for Examination of Water and Wastewater, 13th Edition, or EPA Manual of Methods for Chemical Analyses of Water and Wastes, 1971. Appendix B contains a detailed description of study methods and analytical procedures.

MUNICIPAL AND INDUSTRIAL WASTEWATER DISCHARGERS

General

Ten municipal wastewater treatment plants and three industrial facilities were investigated during the survey (Figures 1 and 2).

FIGURE 2


WEST PENSACOLA MUNICIPAL DISCHARGES
Interstate 10
Lincoln Park W.T.P.
Cr.
Mile
Cr.
U.S.
Mile
Eight
Highway
90
Eleven
Saufley Field W.T.P.
Perdido River
Ditch
Escambia Co
Fairway Mobile Home Park W.T.P.
Crescent Lake
State
Road
296
Cr.
Bellshead
Cr.
Montclair W.T.P.
May Fair W.T.P.
Baldwin Co.
BAY
PERDIDO
Avondale W.T.P.
Bayou
Marcus
N
SCALE IN MILES
1 0 1 2
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JUNE, 1972
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Efficiency studies (one 24-hour composite from influent and effluent locations) were conducted at nine of the municipal plants. Bay Minette, Alabama, was bypassing during the study period and only raw wastewater samples were collected. Industrial wastewater sampling consisted of:

- An effluent sample (24-hour composite) from Tenneco;
- One grab sample at Baldwin Pole and Piling, and,
- A complete evaluation of waste treatment facilities at the St. Regis Paper Company mill (separate report).

Results of municipal sampling are shown in Tables IV and V. Industrial effluent concentrations and loads are presented in Table VI.

May Fair (Subdivision) Wastewater Treatment Plant

The May Fair subdivision is served by a secondary waste treatment plant located adjacent to Amazon Street. The plant, operated by the Pioneer Water Company, treats domestic wastes from the subdivision. Treatment units include a Spirahoff tank, trickling filter, chlorinator, and polishing pond. Discharge is into Bayou Marcus Creek via Bellshead Branch.

During the survey, the average flow was 85,000 gallons per day. The design capacity is 155,000 gpd, and although the plant was not hydraulically overloaded, removal efficiencies were below efficiencies normally expected of a secondary type treatment plant. Study results showed TOC, COD, and suspended solids reductions of 39, 38, and 69 percent, respectively (Table V). BOD_5 results were not obtained because of contaminated dilution water, but based on comparative removals of

TABLE IV

MUNICIPAL WASTE SOURCE DATA SUMMARY

Municipality		Flow (MGD)	ph	BOD_5 (mg/l)	TOC (mg/l)	COD (mg/l)	Residue (mg/l) Total NFLT	Residue (mg/l) Volatile NFLT	Nitrogenous Compounds-N (mg/l) TKN	NH_3	NO_2-NO_3	Total Phos-P (mg/l)	Coliform (MPN/100 ml) Total	Coliform (MPN/100 ml) Fecal	T. Chlorine Residual (mg/l)
May Fair	- Influent	0.085	7.0	Lost*	57	541	180	140	30.0	20.8	0.01	17.6	93,000,000	17,000,000	
	Effluent	0.085	7.3	Lost	35	335	56	36	28.5	8.0	0.45	18.8	180,000	76,000	3.3
	(% Removal)				(39)	(38)	(69)	(74)	(5)	(62)	-				
Montclair	- Influent	0.58	7.1	204	150	529	180	170	28.5	20.6	<0.01	16.7	160,000,000	33,000,000	
	Effluent	0.58	7.3	62	48	199	44	44	19.8	16.0	0.09	16.0	74	63	4.7
	(% Removal)			(70)	(68)	(62)	(76)	(74)	(31)	(22)	-	(4)			
Saufley Field	- Influent	0.16	6.4	Lost*	-	556	140	130	19.0	8.4	0.02	6.9	150,000,000	13,000,000	
	Effluent	0.16	6.3	Lost	46	174	45	41	7.5	2.9	6.5	6.9	66	25	1.3
	(% Removal)					(69)	(68)	(68)	(61)	(65)					
Fairway Mobile Home Park	- Influent	0.017	7.4	306	-	334	81	70	27.0	17.2	<0.01	8.2	120,000,000	40,000,000	
	Effluent	0.017	6.9	170	-	82	31	24	10.0	4.5	2.04	12.5	73,000	20,000	1.1
	(% Removal)			(44)		(75)	(62)	(66)	(63)	(74)	-	-			
Avondale	- Influent	0.46	6.5	Lost*	-	462	120	100	27.0	17.2	<0.01	13.0	61,000,000	34,000,000	
	Effluent	0.46	7.2	Lost	40	232	70	64	16.5	11.8	0.02	13.3	800	<200	1.3
	(% Removal)					(50)	(42)	(36)	(39)	(31)	-	-			
Lincoln Park	- Influent	0.08	6.7	420	150	1,390	250	200	29.0	21.9	<0.01	13.0	-	-	
	Effluent	0.08	6.9	26	17	84	24	18	21.5	19.5	0.02	12.8	18,000,000	4,100,000	-
	(% Removal)			(94)	(89)	(94)	(90)	(91)	(26)	(11)	-	-			
Atmore, AL	- Influent	0.547	6.9	230	-	422	120	88	28.0	20.0	<0.01	15.5	-	-	
	Effluent	0.547	6.9	37	28	52	28	<5	12.0	10.6	1.8	11.9	-	-	-
	(% Removal)			(84)		(88)	(77)	(94)	(57)	(47)	-	(23)			
Foley, AL	- Influent	0.24	7.3	136	24	444	86	60	19.0	12.7	0.01	11.6	-	-	
	Effluent	0.24	7.3	23	30	134	17	14	7.0	4.8	0.04	8.0	-	-	-
	(% Removal)			(83)		(70)	(80)	(77)	(63)	(62)	-	(31)			
Robertsdale, AL	- Influent	0.101	6.5	261	92	495	100	82	13.5	5.7	0.3	13.4	-	-	-
	Effluent	0.101	6.5	13	10	60	14	10	1.4	0.5	1.0	2.2	-	-	
	(% Removal)			(95)	(89)	(88)	(86)	(88)	(90)	(91)	-	(84)			
Bay Minette, AL	- Raw	0.88	6.6	208	-	530	220	180	19.0	14.4	<0.01	11.5	-	-	-

*Contaminated dilution water caused oxygen depletion in bottles.

TABLE V

MUNICIPAL WASTE LOAD SUMMARY (LBS/DAY)

Municipality	Flow (MGD)	BOD_5	TOC	COD	Residue		Nitrogenous Compound-N			Total Phos-P
					Total NFLT	Volatile NFLT	TKN	NH_3	NO_2-NO_3	
May Fair	0.085	-	25	237	40	26	20	5.7	0.3	13
Montclair	0.58	300	232	963	213	213	96	77	0.4	77
Saufley Field	0.16	-	61	232	60	55	10	3.9	8.7	9.2
Fairway Mobile Home Park	0.017	24	-	12	4.4	3.4	1.4	0.6	0.3	1.8
Avondale	0.46	-	153	890	269	246	63	45	0.1	51
Lincoln Park	0.08	17	11	56	16	12	14	13	0.01	8.5
Atmore, AL	0.547	169	128	237	128	23	55	48	8.2	54
Foley, AL	0.24	46	60	268	34	28	14	9.6	0.1	16
Robertsdale, AL	0.101	11	8	51	12	8.4	1.1	0.4	0.8	1.8
Bay Minette, AL	0.88	1,530	-	3,900	1,610	1,320	139	106	0.1	84

TABLE VI

INDUSTRIAL WASTE SOURCE DATA AND LOAD SUMMARY
PERDIDO BAY WATER QUALITY SURVEY
June, 1972

DATA SUMMARY

Industry	Flow (MGD)	Temp. (°C)	pH	BOD_5 (mg/l)	TOC (mg/l)	COD (mg/l)	Residue Total (mg/l)	Residue Total Diss. (mg/l)	Residue Total Vol. (mg/l)	Residue Total NFLT (mg/l)	Residue Vol. NFLT (mg/l)	Residue Settle-able (mg/l)	Lignin (mg/l)	Color (Pt-Co. Units)	Nitrogenous Compounds-N TKN (mg/l)	Nitrogenous Compounds-N NH_3 (mg/l)	Nitrogenous Compounds-N NO_2-NO_3 (mg/l)	Total P (mg/l)	Phenol (µg/l)
St. Regis Paper Co. Cantonment, Florida																			
Influent	25.9	39	9.5	210	264	813	--	--	--	228	139	--	91	1294	--	--	--	--	1270
Effluent	28.6	29.8	8.0	17	122	352	--	--	--	24	12	<0.5	73	1100	4.0	1.01	0.56	0.94	30
Tenneco, Inc. Bay Minette, Alabama																			
Effluent	0.156	--	7.2	340	--	1510	1230	1120	420	120	88	--	--	--	0.8	<0.01	<0.01	1.2	515
Baldwin Pole & Piling Co. Bay Minette, Alabama																			
Effluent	0.002	--	7.0	59	--	174	140	110	120	28	20	--	--	300	--	--	--	--	9,100
LOAD SUMMARY (lbs/day)																			
St. Regis	28.6			4100	29,100	84,000	--	--	--	5720	2860	--	17,400	--	950	240	134	220	7
Tenneco	0.156			440	--	1,960	1,600	1,460	550	160	115	--	--	--	1	--	--	1.5	.7
Baldwin	0.002			1	--	3	2.3	1.8	2.0	0.5	0.3	--	--	--	--	--	--	--	.15

parameters at other trickling filter plants, it is doubtful that BOD_5 reductions would exceed 50 percent. Monthly reports submitted to the Florida Department of Pollution Control (FDPC) since January 1972, showed the average BOD_5 reduction to be 80 percent. The same report showed 66 percent suspended solids removal.

Nitrogen in the influent was primarily ammonia. Treatment oxidized and reduced the ammonia to nitrite-nitrate nitrogen and organic nitrogen. This was the only plant investigated where ammonia was significantly reduced.

Total and fecal coliform reductions appeared to be poor even though the average chlorine residual exceeded 3 mg/l. Effluent total and fecal coliform bacterial densities had means of 180,000 and 76,000/100 ml, respectively. This discrepancy is a result of arithmetically averaging chlorine residuals which ranged from 0.15 to 5 mg/l and geometrically averaging the coliform densities which ranged from 2300 to 9,200,000/100 ml for total and 2300 to 3,500,000/100 ml for fecal. Individually, a high chlorine residual resulted in low coliform densities.

The plant discharged a small waste load (Table V) to Bellshead Branch. However, as this stream drains a small suburban area in western Pensacola, the low flow therein -- especially during dry weather -- would probably not assimilate the wastes.

Montclair (Subdivision) Wastewater Treatment Plant

The wastewater treatment plant serving the Montclair subdivision is located at the west end of Marseille Drive. The plant provides secondary treatment for the domestic wastes from the subdivision's

residents. Treatment units at the plant include primary and secondary clarifiers, trickling filter, polishing pond, and chlorinator. Discharge is into a ditch to Bellshead Branch which flows into Bayou Marcus Creek.

The present flow of 580,000 gallons per day through the plant exceeded the hydraulic design capacity of 500,000 gpd. Effects of the hydraulic overload are reflected in the low BOD_5, TOC and COD reductions of 70, 68, and 62 percent, respectively. Average BOD_5 removal for the winter months, reported to the FDPC, was 85 percent. Reported suspended solids removals were 75 percent; during this study a 76 percent reduction was measured. Study results showed that total nitrogen was reduced 30 percent; phosphorus reduction was negligible. Effluent total and fecal coliform densities were 74 and 63/100 ml, respectively. These low density levels show excellent chlorination results. The total chlorine residual was greater than 4 mg/l.

Water quality in Bellshead Branch was not monitored. However, in view of the large waste loads discharged (Table V), it is highly probable that water quality in the stream is severely degraded.

Saufley Field (Navy)

The wastewater treatment plant serving Saufley Field is located at the southwest corner of the Federal installation. The plant receives domestic wastes from a population of 1,700 and some industrial wastes from aircraft washing and engine cleaning. The secondary plant is a standard rate trickling filter plant with chlorination. Flow during the survey was 160,000 gallons per day; however, the Navy indicated

that the average flow was usually 225,000 gpd. Discharge is into Perdido Bay through a 4,500-foot concrete-lined ditch.

The hydraulic design capacity of the plant is 210,000 gpd. Although the plant did not appear to be hydraulically overloaded during the survey, removal efficiencies were below values normally expected from a secondary type treatment plant. Contaminated dilution water precluded BOD_5 results; however, the Navy stated that BOD_5 reduction averaged about 91 percent. Suspended solids removals were also reported to average 93 percent; however, during this survey, a 68 percent reduction was determined (Table IV). Study results showed that 69 percent of the COD was removed. Low efficiencies indicate that toxic degreasing compounds in the engine cleaning wastewater might be interfering with biodegradation.

The TKN and ammonia nitrogen decreases along with a nitrite-nitrate nitrogen increase show significant waste oxidation. Phosphorus removal was nil.

Bacterial reductions were excellent. Total and fecal coliform densities were 66 and 25/100 ml, respectively. The total chlorine residual was greater than 1 mg/l.

Although a moderate waste load (Table V) was discharged, its effect on Perdido Bay was probably masked by the volume of wastewater in Elevenmile Creek.

Fairway Mobile Home Court Wastewater Treatment Plant

The wastewater treatment facility serving the Fairway Mobile Home Court is located within the Fairway Mobile Home Park north of Michigan Avenue and east of Crescent Lake. The plant, operated by

the Pioneer Water Company, provided secondary treatment (extended aeration and chlorination) for the domestic wastes from the residence of 140 mobile homes. Discharge is into Bayou Marcus Creek.

The plant is designed for a flow of 30,000 gpd. Although the plant was not hydraulically overloaded (present flow - 17,000 gpd), BOD_5 reduction was much lower (44 percent) than expected from an extended aeration plant (Table IV). Monthly reports submitted to the FDPC since January 1972 indicate a 95 percent BOD_5 reduction. The same report showed that suspended solids removals averaged 75 percent; a 62 percent reduction was measured during the survey. The COD reduction was 75 percent -- much greater than expected with the low BOD_5 removal.

TKN and ammonia nitrogen decreases were 63 percent and 74 percent, respectively. The increase in nitrite-nitrate nitrogen concentrations from less than 0.01 mg/1 to 2.04 mg/1 reflects significant waste oxidation.

Total and fecal coliform reductions were greater than 99.9%; however, the geometric mean densities discharged were 73,000/100 ml -- total and 20,000/100 ml -- fecal. The average total chlorine residual was 1.1 mg/1, and a greater bacterial reduction should have resulted. The higher than normal discharge densities may have been due to inadequate contact time and/or unavailable chlorine. Total chlorine residual was measured and a portion of this was probably utilized in the oxidation of organic matter.

The small waste load discharged (Table V) would probably not severely degrade a small receiving stream such as Bayou Marcus Creek; however, the cumulative effect of all discharges into the creek may cause noticeable water quality degradation.

Avondale (Subdivision) Wastewater Treatment Plant

The wastewater treatment plant serving the Avondale subdivision is located west of Bellview Road and north of Bayou Marcus Creek. The plant provided secondary treatment (extended aeration and chlorination) for the domestic wastes from the subdivision residents. (There is no industrial waste from the subdivision.) Discharge is into Bayou Marcus Creek.

The hydraulic design capacity of the plant is 350,000 gpd. The present flow of 460,000 gpd hydraulically overloaded the facility and reduced plant efficiency. Reductions of COD, suspended solids and total nitrogen were 50, 42, and 39 percent, respectively (Table IV). Nitrogen oxidation was slight. Contaminated dilution water precluded EPA BOD_5 results, but based on comparative removals of parameters at other extended aeration plants, it is doubtful that BOD_5 reductions would exceed 75 percent. The monthly report submitted to the FDPC indicated that suspended solids and BOD_5 removals average 85 and 90 percent, respectively.

Total and fecal coliform densities discharged were 800 and <200/100 ml, respectively; chlorine residual was greater than 1 mg/l.

The plant discharged a large organic waste load (Table V) to Bayou Marcus Creek downstream from the sampling station on Bellview Road,

and the effects of the discharge on the creek were not measured. The wastes would probably have a measurable effect on the bay if they were discharged directly into the bay.

Lincoln Park (Subdivision) Wastewater Treatment Plant

The Lincoln Park subdivision is served by a secondary treatment facility located near the west end of Arron Drive (north of Interstate 10 and west of U.S. 29). Wastewater treatment for domestic waste generated within the subdivision includes contact stabilization followed by chlorination and polishing ponds. Discharge is into Eightmile Creek, a tributary of Elevenmile Creek.

The plant, operating at its hydraulic design capacity of 80,000 gpd, achieved excellent organic and solids removals; BOD_5 removal was 94 percent, TOC - 89 percent, COD - 94 percent, total and volatile suspended solids - 90 percent (Table IV). There was some nitrogen oxidation, but phosphorus removal was negligible. The effluent contained high coliform densities which indicated the chlorinator was not operating. The effluent contained total and fecal coliform bacterial densities of 18,000,000 and 4,100,000/100 ml, respectively.

The plant discharged a small (17 pounds per day - BOD_5; 11 pounds per day - TOC; 16 pounds per day - suspended solids) waste load into Eightmile Creek. Although water quality in Eightmile Creek was not monitored, increased bacterial densities would probably be the most noticeable change in water quality resulting from this discharge.

Atmore, Alabama

The plant serving Atmore is located west of town on U.S. Highway 31. The secondary wastewater treatment facility (high-rate trickling filter, primary and secondary clarification -- no chlorination) serves a population of about 9,000. Discharge is into Boggy Creek which flows into Brushy Creek -- an interstate stream. Brushy Creek flows 20 miles to the Perdido River. The hydraulic design capacity of the plant is 1.5 MGD; present flow was approximately 0.55 MGD. The plant operator stated that there was a high rate of infiltration; however, the survey wastewater volume of 61 gallons per capita per day does not indicate an excessive amount of infiltration.

Treatment removals were: BOD_5 - 84 percent, COD - 88 percent, total suspended solids - 77 percent, volatile suspended solids - 94 percent, total nitrogen - 57 percent, and phosphorus - 23 percent (Table IV). Previously reported data to the Alabama Water Improvement Commission (AWIC) showed BOD_5 removal to average about 80 percent.

The discharged waste load (Table V) probably has only a minor effect on Brushy Creek. Based on U. S. Geological Survey data, dilution at the discharge point is 20:1 for average yearly flows and 10-15:1 during dry weather.

Foley, Alabama

The wastewater treatment plant serving Foley is located east of town near U.S. Highway 98. It provides secondary treatment (oxidation pond -- no chlorination) for the wastes from approximately 1,400 people. Survey flow was approximately 240,000 gallons per day. Discharge is into Wolf Creek, a tributary to Wolf Bay. The oxidation

pond is designed to serve 3,000 people, the town's present population.

The measured treatment efficiencies were in the range of those expected from a satisfactorily operating oxidation pond. Percent removals were: BOD_5 - 83, COD - 70, suspended solids - 80, total nitrogen - 63, and total phosphorus - 31 (Table IV). The BOD_5 removal previously reported to the AWIC averaged 87 percent.

The plant contributed a small (Table V) load to Wolf Creek. However, because of the low stream flow at the discharge point (creek originates in Foley), the waste probably degrades the stream quality.

Robertsdale, Alabama

The wastewater treatment plant serving Robertsdale is located on the east side of town. It provides secondary treatment for the wastes from 1,300 of the town's 2,100 residents. The plant, designed to serve 2,500 people (0.25 MGD), is an extended aeration type. Principal treatment units include a comminuting device, two aeration basins, aeration equipment and a sludge settling compartment. The aeration basins have a combined volume of 251,300 gallons. Air is supplied to the basins by three blowers each having a capacity of 300 cubic feet per minute. Survey flow was 100,000 gallons per day; discharge is into Rock Creek, a tributary of Blackwater River.

This plant provided the highest degree of treatment of any plant investigated. Percent removals were BOD_5 - 95, TOC - 89, COD - 88, suspended solids - 87, TKN - 90, and phosphorus - 84 (Table IV). Previously-reported BOD_5 removals to the state were 83 percent.

A well-treated wastewater -- BOD_5 - 13 mg/l (11 pounds per day), TOC - 10 mg/l (8 pounds per day), COD - 60 mg/l (51 pounds per day), total suspended solids - 14 mg/l (12 pounds per day), total nitrogen - 2.4 mg/l (1.9 pounds per day), and total phosphorus - 2.2 mg/l (1.8 pounds per day) -- was discharged into Rock Creek.

Bay Minette, Alabama

Bay Minette has two wastewater treatment plants. The northwest portion of town, about 10 percent of the sewered population, is served by a waste stabilization pond which discharges into the Mobile River Basin. The other treatment facility, a primary plant, serves the remainder of the sewered population. The plant, located east of the city near U. S. Highway 31, discharges into the Perdido drainage basin. During the survey, this plant was being bypassed and, reportedly had been bypassing for an extended period of time. The plant, however, has been placed back into operation since the survey. The wastewater from 5,000 people (880,000 gpd) flowed via a ditch into Hollinger Creek and thence into the Styx River.

The loads discharged (Table V) undoubtedly severely affected water quality in the receiving stream because of the low flow; Hollinger Creek originates in Bay Minette.

A construction grant was awarded to Bay Minette for the construction of a stabilization pond system to replace the primary facility. The proposed system will consist of one 53.3-acre primary pond, an 11-acre secondary pond, and an 11-acre polishing pond. The system will also treat the industrial wastes from the Newport Division of Tenneco

Chemicals, Inc., located in Bay Minette. Final plans were to have been submitted in January 1972, with construction to have been complete August 1972. The site originally selected was later determined to be too close to populated areas, and relocation has caused a three months delay. Construction is scheduled to begin September 1, 1972.

Baldwin Pole and Piling Company, Bay Minette, Alabama

The Baldwin Pole and Piling Company operation is located on the east side of town adjacent to U. S. Highway 31. The operation consists of treating poles, posts, piles, and lumber with creosote to prevent decay and protect against insects. The process includes preservative impregnation, vacuum conditioning for cleanliness and excess creosote recovery, and post steam treatment.

The log debarking, size separating and other pretreating facilities are located on the south side of U.S. Highway 31 about one mile from the creosote treatment facility. The only water used at this site is for sanitary purposes.

Wastewater from the final steam treatment contains impurities. This wastewater, steam condensate, and surface runoff drain into a ditch which, before leaving the property, flows through an old settling basin into a natural ponding system. Wastewater eventually reaches McCurtin Creek which flows into Dyas Creek, a tributary to Perdido River. A gas chromatograph/mass spectrometric analysis of the effluent showed organics normally found in creosote, a commercial fraction derived from coal tar. The primary environmental effect of these organics would be taste and odor problems. However, the phenolics,

quinolines, and phenanthrene are also toxic to fish. Several of the polycyclic, aromatic hydrocarbons such as acenapthene and phenanthrene have caused benign tumors in test animals. Appendix D contains a detailed description of each compound identified. The GC/MS analyses showed 7,500 µg/l of phenols while the chlorimetric analysis showed 9,100 µg/l. Either colorimetric positive interferences were present (as the GC/MS method is a more accurate phenol detector) or phenolic organic present was not extractable for GC/MS analyses. Waste flow was about 2,000 gpd, and the loads discharged were small (Table VI).

Newport Division, Tenneco Chemicals, Inc., Bay Minette, Alabama

The Newport Division of Tenneco Chemicals, Inc., operates a plant located in the southwest section of Bay Minette. Plant operation consists of refining crude tall oil and sulfate turpentine purchased from Kraft pulp and paper mills. These refined products are used in the manufacture of fatty acids, resins, terpene, paper size, gloss oils and rubber emulsifying agents.

Process wastewater and contaminated surface runoff are being treated in ponds which provide settling and some biological treatment. Sanitary wastes are discharged to the city sewerage system. Process wasteflow during this survey was 0.156 mgd; discharge is into Hollinger Creek.

The principal waste treatment problem is emulsions in water. The company's consulting engineer has made recommendations for either partial or complete treatment. Partial treatment will be provided if the wastes are discharged to the proposed Bay Minette municipal treatment facility. Complete treatment will be provided if the company does not use the

municipal system. Pre-treatment would be physical-chemical. Complete treatment would be physical-chemical followed by biological.

A gas chromatograph/mass spectrometric analysis of the effluent showed many organic compounds which were primarily hydrocarbons typical of oil (Appendix D). The effluent contained 190 mg/l of oil and grease. Two fatty acids and one resin acid were also detected. These acids are foam-causing constituents.

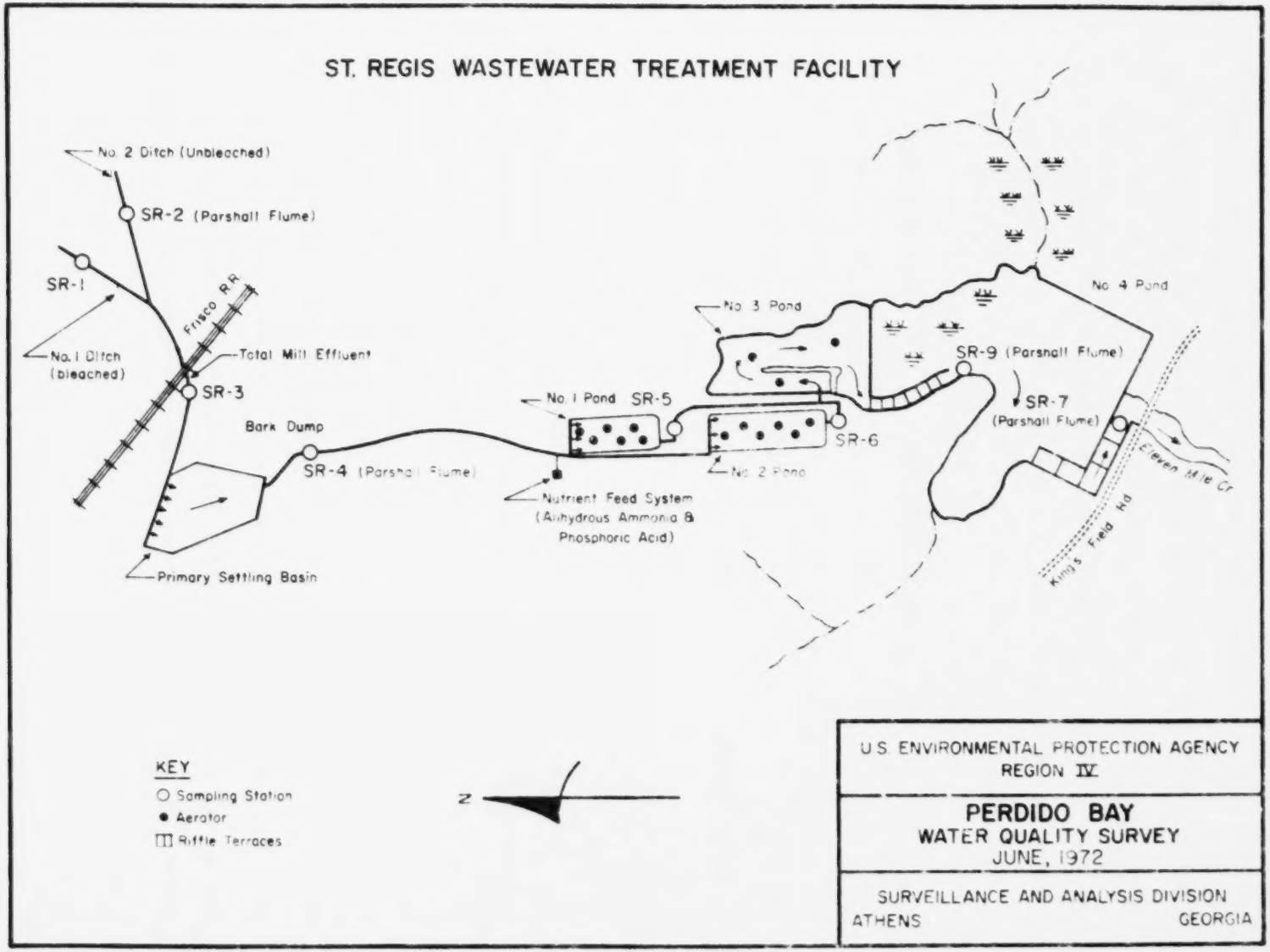
The company's wastewater discharge (Table VI) probably has a very noticeable affect on water quality in Hollinger Creek because of low flow in the creek at the point of discharge. Hollinger Creek flows into the Styx River and thence into the Perdido River; however, the pollutional effects on Perdido Bay were not measurable -- distance to the bay is about 50 miles.

St. Regis Paper Company, Cantonment, Florida

St. Regis operates an integrated pulp and paper mill which, during the survey, produced approximately 830 tons per day of bleached and unbleached pulp by the sulfate (Kraft) process. Approximately 280 tons per day of pulp were bleached. Pulp was converted into approximately 785 tons per day of bleached and unbleached products. Liquid wastes, generated in the mill, are discharged into Perdido Bay via Elevenmile Creek.

The wastewater treatment facilities consist of a primary settling basin, a nutrient feed system (anhydrous ammonia and phosphoric acid), three aeration ponds (Nos. 1 and 2 in parallel), and a final settling pond (Figure 3). Riffle terraces are located before and after the final

FIGURE 3


ST. REGIS WASTEWATER TREATMENT FACILITY
No. 2 Ditch (Unbleached)
SR-2 (Parshall Flume)
SR-1
Frisco R.R.
No. 1 Ditch (bleached)
Total Mill Effluent
SR-3
Bark Dump
SR-4 (Parshall Flume)
Primary Settling Basin
No. 1 Pond
SR-5
Nutrient Feed System (Anhydrous Ammonia & Phosphoric Acid)
No. 3 Pond
No. 2 Pond
SR-6
No. 4 Pond
SR-9 (Parshall Flume)
SR-7 (Parshall Flume)
Eleven Mile Cr.
King's Field Rd
KEY
Sampling Station
Aerator
Riffle Terraces
N
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV
PERDIDO BAY
WATER QUALITY SURVEY
JUNE, 1972
SURVEILLANCE AND ANALYSIS DIVISION
ATHENS GEORGIA

pond. During dry weather, the wastewater discharged into Elevenmile Creek makes up most of the flow. Sanitary wastes were treated in several septic tanks with drain fields.

An evaluation of the wastewater treatment facility showed that the average wastewater volume was 28.6 MGD; waste loads and average reductions were:

Parameter	Percent Reduction	Final Discharge
BOD	91	4,100 lbs per day
TOC	49	29,100 lbs per day
COD	52	84,000 lbs per day
Suspended Solids	88	5,720 lbs per day
Lignin	11	17,400 lbs per day
Color	15	1,100 Pt.-Co. Units

All of the nitrogen and phosphorus added by the nutrient feed system as part of the treatment process were not being removed effectively. The nitrogen and phosphorus in the discharge reflect both unused nutrients and the presence of waste-assimilating microorganisms which contain the nutrients. Optimal nutrient feed concentrations and methods to reduce the volume of microorganisms in the discharge are necessary. Excessive total nitrogen (1,084 pounds per day) and total phosphorus (220 pounds per day) were being discharged; these nutrients could adversely affect Perdido Bay's water quality either through over-enrichment or degradation by sludge deposits.

Only a minor amount of fecal contamination was discharged into Elevenmile Creek. Untreated waste had geometric mean total and fecal coliform bacterial densities of 19,000 and 790/100 ml, respectively. Treatment reduced the total coliform density to 12,000/100 ml (37 percent reduction) and the fecal coliform density to 230/100 ml (71 percent reduction).

Gas chromatograph/mass spectrometric analyses on the untreated and treated wastewater showed organics typical of paper mill wastes. The organics were constituents of wood or degradation products of wood constituents (Appendix D). Treatment reduced the foam-causing constituents, fatty and resin acids, by 66 percent -- from 3,500 µg/l to 1,200 µg/l. Phenolics -- toxic to man and fish -- were reduced from 2,000 µg/l at the influent to the primary settling basin to below detectable limits at the final discharge into Elevenmile Creek. A scan of the raw water source (Station SR-8) did not reveal the presence of any organic compounds in concentrations greater than 10 µg/l.

The detrimental effect which the paper mill's discharge has on the water quality in Elevenmile Creek and Perdido Bay is discussed later in the report.

PERDIDO BAY TRIBUTARIES

General

To evaluate the effect of waste discharges on these streams, water quality was analyzed at the following locations in Elevenmile Creek, Perdido River, and Bayou Marcus Creek:

EPA Station No.	Location
PR-1	Perdido River at Florida Hwy. 184 W. of Cantonment, Florida
P-1	Perdido River at mouth
B-1	Bayou Marcus at mouth
EM-1	Elevenmile Creek at State Route 297A
EM-2	Elevenmile Creek at State Route 10 (US 90A)
EM-3	Elevenmile Creek at Route 10A (US 90)
EM-4	Elevenmile Creek at mouth

Elevenmile Creek

The majority of the wastes discharged into Elevenmile Creek came from the St. Regis Paper Company mill at Cantonment, Florida. During dry weather, the mill's waste discharge makes up most of the flow in the upper reaches of the creek. The Lincoln Park subdivision, located north of Pensacola, discharges a relatively small wastewater volume into Eightmile Creek, a tributary to Elevenmile Creek.

Escambia County operates an open, non-burning dump adjacent to Elevenmile Creek about one mile north of U. S. Highway 90. The dump has "dry" and "wet" disposal areas. Dry area operation consists of dumping and compacting several months accumulation of solid wastes to a given elevation and then covering with dirt. Wet area operation consists of discharging septic tank wastes and disgested sludge from Pensacola's main wastewater treatment plant on the bank of a previously "constructed" solid waste fill. In June 1972, the dump was diked along the creek, and dredging for dike construction was in progress along the north

side of the property during the survey. The presence of leachate from this dump was not detectable in Elevenmile Creek.

At Florida Highway 297A (Station EM-1), located about two miles downstream from St. Regis, all parameter concentrations were approximately the same as in the paper mill effluent (Table VII). With the dry weather conditions and negligible runoff reaching the creek, little infiltration would have occurred during the period of study. From Station EM-1 to the bay, parameter concentrations generally decreased, reflecting dilution, settling and biological degradation. Most parameters showed the greatest reduction between U.S. Highway 90 and the Bay. This was probably due to the effect of tidal dilution.

The creek conveyed significant nitrogen and phosphorus concentrations (2.38 mg/l and 0.46 mg/l) into the bay. These levels could aggravate water quality degradation by causing over-enrichment resulting in excessive algal blooms. The mean total coliform densities in Elevenmile Creek ranged from 5,300 to 15,000/100 ml at Stations EM-3 and EM-1, respectively. The creek contributed mean total and fecal coliform densities of 11,000 and 110/100 ml, respectively, to Perdido Bay.

During the June 1972 survey, dissolved oxygen (DO) was determined by the Winkler (azide modification) method. However, questions arose concerning the accuracy of DO results using the Winkler method in waters containing Kraft paper mill wastes. Subsequently, a limited field investigation was conducted to determine the DO of Elevenmile Creek using the following:

TABLE VII

ST. REGIS EFFLUENT AND ELEVENMILE CREEK CONCENTRATIONS

PARTIAL DATA SUMMARY
PERDIDO BAY WATER QUALITY SURVEY

	BOD (mg/l)	TOC (mg/l)	COD (mg/l)	Residue Total NFLT (mg/l)	Residue Vol. NFLT (mg/l)	Color (Pt. Co. Units)	Lignin (mg/l)
St. Regis' Effluent	17	122	352	24	12	1100	73
EM-1	19	116	340	31	10	1030	70
EM-2	16	106	299	28	10	878	63
EM-3	13	73	234	28	12	689	49
EM-4	6.5	63	--	14	7	588	38
% Reduction from Effluent to EM-4	62	48	--	42	42	47	48

- Winkler (azide modification) run immediately;
- Winkler (azide modification) dosed in field and acidified in lab, then titrated;
- Weston Stack DO probe, and
- Yellow Springs Instruments DO probe.

The conclusions from the comparative study showed that:

- Winkler values were 2 to 3 mg/l lower than probe values.
- The Winkler value on an immediately-titrated sample is higher than on a dosed sample held for some time.
- The YSI probe value is consistently lower than the Weston Stack value in paper mill waste and tap water but not distilled water.
- On aerated paper mill waste and aerated tap water, both probes produce comparable results.
- The Weston Stack probe and the Winkler DO tap water do not compare, but the YSI probe and Winkler are comparable on tap water. Once the tap water is aerated, all three are comparable.

Because of the interference differences, the Winkler DO values for Elevenmile Creek obtained during the June survey are not included in this report.

In 1969, BOD_5 in Elevenmile Creek at Station EM-1 (Florida Highway 297A) averaged 151 mg/l; at Station EM-3 (U. S. Highway 90) the BOD_5 averaged 121 mg/l. The total organic carbon at Stations EM-1 and EM-3,

were 72 and 35 mg/l, respectively -- much less than values recorded during the 1972 study. In general, the water quality of Elevenmile Creek has improved since September 1969. However, Elevenmile Creek is still the largest waste contributor to Perdido Bay with the daily discharge contributing 4,100 pounds of BOD_5 (Table VIII).

Perdido River

Samples collected at Station PR-1 (Florida Highway 184), which is above tidal influence, reflected background water quality. The average parameter concentrations observed showed the river at this location to be relatively unpolluted and generally of better quality than bay water at locations sampled (Table IX). The mean total and fecal coliform densities at this point were 970 and 110/100 ml, respectively. The mean total and fecal coliform contributions of the Perdido River to Perdido Bay were 290 and 23/100 ml, respectively, as measured at the mouth of the river (Station P-1). Although there are upstream waste sources, the wastes are diluted and/or stabilized by the time they reach this point. During the latter part of the survey, rainfall within the basin caused river flow and suspended solids concentrations to increase slightly. Because of the large volume of flow in Perdido River, the river is second only to St. Regis in the volume of pollutants discharged into Perdido Bay (Table VIII). However, because of the stability of the pollutants, the river does not detrimentally affect water quality in the bay.

Bayou Marcus Creek

Analytical results of samples collected from Bayou Marcus Creek at Bellview Road (Station B-1) do not completely reflect the effects of

TABLE VIII
SUMMARY OF WASTE INPUT (LBS/DAY) TO PERDIDO BAY
PERDIDO BAY WATER QUALITY STUDY
JUNE 1972

Waste Source	BOD_5		TOC		Residue				Lignin		Nitrogenous Compounds-N								Total P-P	
					Total NFLT		Vol NFLT				TKN		NH_3		NO_2-NO_3		Total			
	Load*	%**	Load	%	Load	%	Load	%	Load	%	Load	%	Load	%	Load	%	Load	%	Load	%
Eleven Mile Creek																				
St. Regis Paper Co.	4,100	69	29,100	86	5,720	26	2,860	24	17,400	97	950	66	240	58	134	50	1,084	63	220	48
Lincoln Park Subdivision	17	<1	11	<1	16	<1	12	<1	--	--	14	1	13	3	--	--	14	1	8	[illegible]
Bayou Marcus																				
May Fair Subdivision	--	--	25	<1	40	<1	26	<1	--	--	20	1	6	1	.3	<1	20	1	13	3
Montclair Subdivision	300	5	232	1	213	1	213	2	--	--	96	7	77	18	.4	<1	96	6	77	17
Avondale	--	--	153	<1	269	1	246	2	--	--	63	4	45	11	.1	<1	63	4	51	11
Fairway Mobile Home Park	24	<1	--	--	4	<1	3	<1	--	--	1	<1	1	<1	.3	<1	1	<1	2	<1
Saufley Field	--	--	61	<1	60	<1	55	<1	--	--	10	1	4	1	9	3	19	1	9	2
Perdido River	1,530	26	4,400	13	15,600	71	8,300	71	610	3	290	20	31	7	123	46	413	24	77	17
Samples collected at Fla. Hwy. 184																				
(Flow at Barrineau Park - 285 cfs)																				
Totals:	5,971	100	33,982	100	21,922	100	11,715	100	18,010	100	1,444	100	417	100	267	100	1,710	100	457	100

* Load in lbs/day
** % of total input to bay

TABLE IX

PERDIDO BAY AND TRIBUTARY WATER QUALITY DATA SUMMARY
PERDIDO BAY WATER QUALITY SURVEY
June, 1972

EPA Station No.	pH	Temp (°C)	DO (mg/l)	BOD_5 (mg/l)	Color (Pt-Co. Units)	Lignin (mg/l)	TKN (mg/l)	NH_3-N (mg/l)	NO_2-NO_3-N (mg/l)	Total P (mg/l)	TOC (mg/l)	Conduct. (umhos/cm)	Chlorides (mg/l)	COD (mg/l)	Residue Total NFLT	Residue Vol. NFLT
EM-1	7.7	32	--	19	1028	70	--	--	--	--	116	--	--	340	31	10
EM-2	7.7	32	--	16	878	63	--	--	--	--	106	--	--	299	28	10
EM-3	7.6	28	--	13	689	49	--	--	--	--	73	--	--	234	28	12
EM-4	7.5	28	--	6.5	588	38	1.8	0.53	0.57	0.46	63	2520	--	--	14	7
B-1	6.4	25.5	4.7	1.2	36	0.4	0.45	0.03	0.76	0.57	4	170	7.6	--	8	5
B-2	7.0	25	8.3	1.0	33	0.4	0.19	0.02	0.08	0.05	2.9	88	--	<50	10	5
P-1	7.4	27.7	7.1	2.0	29	0.6	0.21	0.02	<0.01	0.02	4	10,600	--	--	11	<5
P-2	7.6	27.5	6.4	1.0	67	2.7	0.21	0.04	0.03	0.05	8	17,400	6,050	--	--	--
P-3	7.9	27.5	6.8	--	55	1.7	0.33	<0.01	0.01	0.05	7	18,000	--	--	--	--
P-4	8.0	27.4	6.9	--	46	1.4	0.22	<0.01	0.01	0.03	7	17,500	--	--	--	--
P-5	8.1	27.3	6.9	1.5	44	1.4	0.20	<0.02	0.02	0.04	7	19,300	6,610	--	--	--
P-6	8.1	27.4	6.6	--	47	1.4	0.18	<0.01	0.01	0.05	7	19,100	--	--	--	--
P-7	8.1	27.4	6.8	1.4	44	1.2	0.23	<0.01	0.02	0.04	6	19,400	--	--	--	--
P-8	8.2	27.3	6.8	--	41	1.1	0.22	0.01	0.01	0.04	6	20,300	--	--	--	--
P-9	8.1	27.5	7.1	1.0	37	1.0	0.17	0.02	<0.01	0.03	7	21,200	6,980	--	--	--
P-10	8.1	27.2	6.5	--	38	1.1	0.23	0.01	<0.01	0.04	6	20,200	--	--	--	--
P-11	8.2	27.6	6.9	--	34	0.9	0.23	0.02	0.01	0.03	5	21,600	--	--	--	--
P-12	8.4	27.5	7.4	1.4	32	0.9	0.19	0.02	0.01	0.02	5	22,500	--	--	--	--
P-13	8.5	27.6	7.3	--	31	0.9	0.19	0.01	0.01	0.03	5	23,300	--	--	--	--
P-14	8.5	27.6	7.0	1.1	26	0.8	0.23	<0.01	<0.01	0.02	5	24,000	--	--	--	--
P-15	8.5	27.5	7.1	--	25	0.6	0.21	0.01	<0.01	0.02	4	26,000	--	--	--	--
P-16	8.5	27.5	7.0	--	21	0.4	0.16	<0.01	<0.01	0.02	4	27,500	--	--	--	--

municipal discharges on water quality in the creek (Table IX). At this station, the average BOD_5 (1.2 mg/l) was almost at background levels; TOC (4 mg/l) and suspended solids (8 mg/l) were low; color (36 Pt.-Co. units) was about the same level as the color in the Perdido River at Florida Highway 184. Only total nitrogen (1.21 mg/l), phosphorus (0.57 mg/l), and bacteriological data (total and fecal coliform densities of 29,000 and 2,300/100 ml, respectively) reflect upstream discharges. The dissolved oxygen concentrations averaged 4.7 mg/l which is in compliance with the water quality criteria associated with Florida's Class III water use classification of this stream.

PERDIDO BAY

General

To evaluate water quality in Perdido Bay, 15 locations were sampled for five days (Table X, Figure 4). Elevenmile Creek was the major source of waste input into the bay; Perdido River was the second largest contributor; Bayou Marcus Creek was the third greatest source.

Current Movement

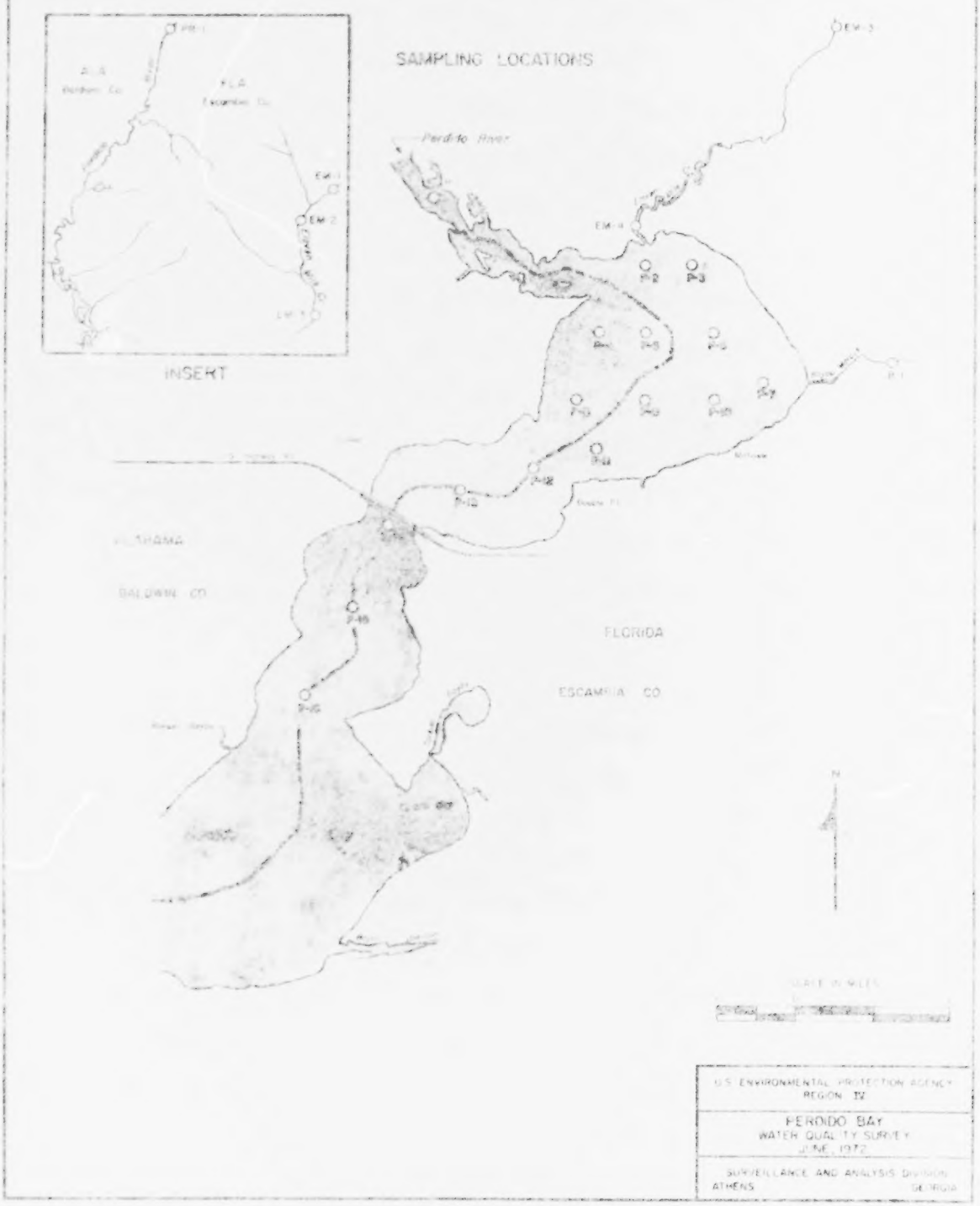
A limited examination of the chloride profiles in the estuary provided information on water movement and waste distribution. The only factors which cause variations in chloride concentration at a particular point are turbulent diffusion due to tidal currents and advection caused by freshwater inflow, principally from the Perdido River. The volume of freshwater inflow, as well as the physical configuration of the bay, affects the flushing rate of wastes from Perdido Bay.

TABLE X
PERDIDO BAY STATION LOCATIONS

Location Number	Location Description
P2	0.25 Nautical Miles South of Eleven Mile Creek
P3	0.5 Nautical Miles East of P2
P5	1.0 Nautical Miles South of Eleven Mile Creek
P4	0.5 Nautical Mile West of P5
P6	0.75 Nautical Miles East of P5
P9	1.75 Nautical Miles South of Eleven Mile Creek
P8	0.75 Nautical Miles West of P9
P10	0.75 Nautical Miles East of P9
P7	0.5 Nautical Mile West of Bayou Marcus
P11	0.7 Nautical Mile Southwest of P9
P12	0.75 Nautical Mile Westerly of P11 in Middle of Bay
P13	1.5 Nautical Miles Westerly of P11 in Middle of Bay
P14	At US 98 Bridge - Middle of Bay
P15	1 Mile Southerly of US 98 Bridge in Middle of Bay
P16	2 Miles Southerly of US 98 Bridge in Middle of Bay

NOTE: Compass Directions are Magnetic

FIGURE 4


SAMPLING LOCATIONS
INSERT
Perdido River
EM-1
EM-2
EM-3
EM-4
P-1
P-2
P-3
P-5
P-7
P-9
P-10
P-11
P-12
P-13
P-14
P-15
P-16
ALABAMA
BALDWIN CO
FLORIDA
ESCAMBIA CO
N
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ATHENS
GEORGIA

The predominant flooding current patterns in Perdido Bay (Figure 5) were derived from chloride analyses and/or conductivity measurements at the bay water quality sampling stations. Water from the Perdido River disperses primarily in a southerly direction along the western shore of the bay; some flow moves easterly along the northern portion of the bay and mixes with the water from Elevenmile Creek. Saline water flows northeasterly from the lower bay into the upper bay where it disperses in a northerly and easterly direction.

The 1969 FWPCA current movement study was more detailed than the 1972 study. Results of the 1969 study indicated that currents in the upper portion of the Bay were weak and circulation was poor. The predominant current pattern during both flood and ebb tides indicated that circulation was counterclockwise in the northern portion of the bay with freshwater flowing south along the Alabama shore of the bay and saline water advancing along the Florida shore. The 1969 study also included dye investigations which showed that flow from Elevenmile Creek was carried into Perdido River and along the Alabama shore.

Dissolved Oxygen

Average dissolved oxygen (DO) concentrations ranged from 6.4 mg/l to 7.4 mg/l at stations located in the bay and lower Perdido River (Table IX). Water quality standards require 4 mg/l in the bay and 5 mg/l in the river. The lower DO values observed in the northeast quadrant of the upper bay somewhat reflected the waste flows from Elevenmile Creek. This area also had the highest theoretical oxygen demand (TOD - Table XI).

FIGURE 5

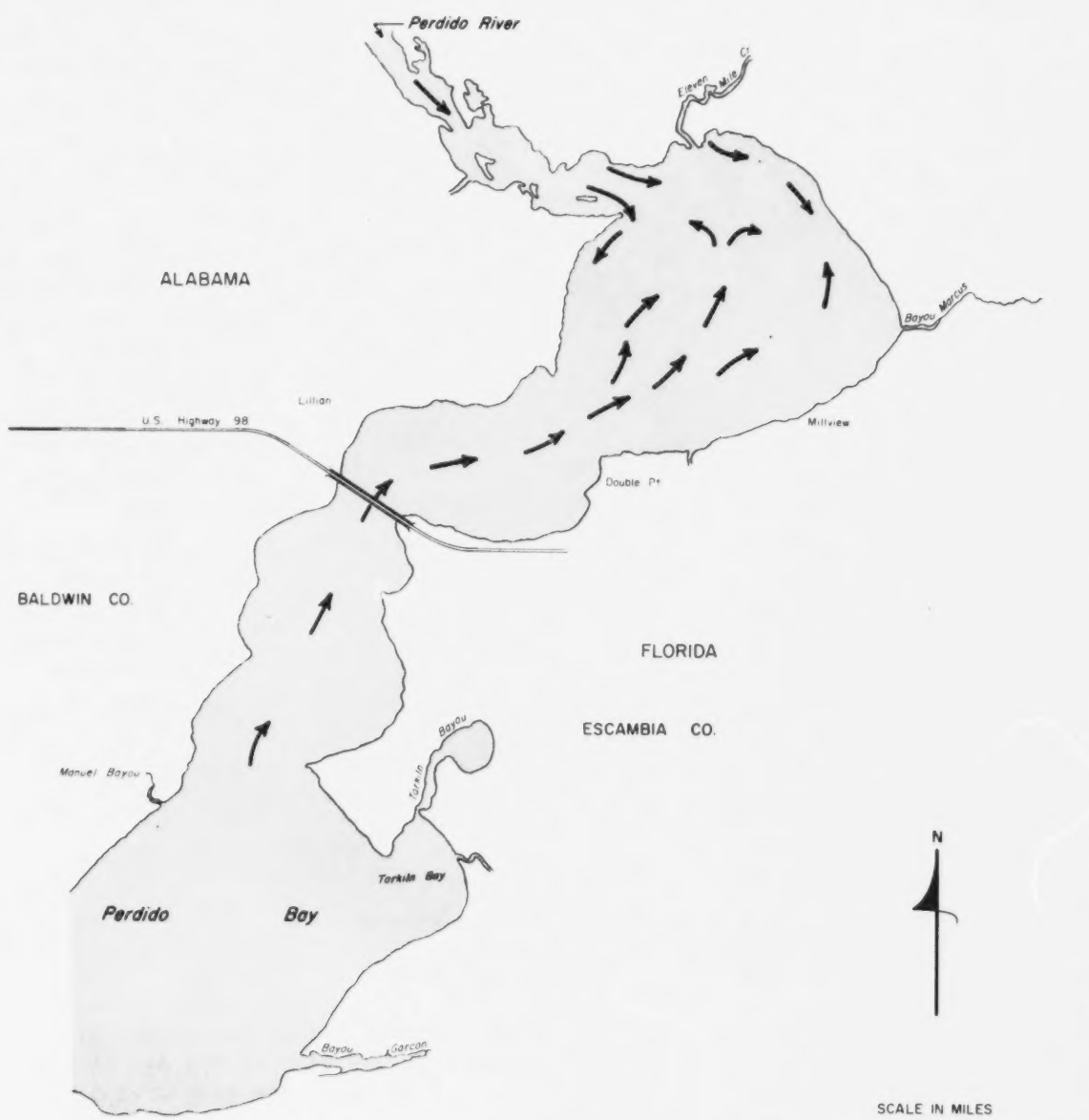
FLOODING CURRENT PATTERN AT MID-DEPTH
Perdido River
Eleven Mile Cr.
ALABAMA
Bayou Marcus
Lillian
U.S. Highway 98
Millview
Double Pt.
BALDWIN CO.
FLORIDA
ESCAMBIA CO.
Bayou Torkin
Manuel Bayou
Torkin Bay
Perdido Bay
Bayou Garcon
N
SCALE IN MILES
1 0 1 2
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TABLE XI

AVERAGE DO-BOD-TOD IN PERDIDO BAY
PERDIDO BAY WATER QUALITY SURVEY

June 1972

Station	DO (mg/1)	BOD (mg/1)	TOD* (mg/1)
P-1	7.1	2.0	11.6
2	6.4	1.0	22.3
3	6.8	---	20.2
4	6.9	---	19.7
5	6.9	1.5	19.6
6	6.6	---	19.5
7	6.8	1.4	17.1
8	6.8	---	17.0
9	7.1	1.0	19.5
10	6.5	---	17.1
11	6.9	---	14.4
12	7.4	1.4	14.2
13	7.3	---	14.2
14	7.0	1.1	14.4
15	7.1	---	11.6
16	7.0	---	11.4

* TOD = 2.67 (TOC) + 4.57 (TKN) (1)

where:

TOD = theoretical oxygen demand
TOC = total organic carbon
TKN = total Kjeldahl nitrogen

NOTE: This relationship presumes that all of the carbon will eventually be oxidized to carbon dioxide and all of the unstabilized nitrogen to nitrates. The total organic carbon (TOC) is a direct measure of organic carbon, and each pound of TOC discharged required 2.67 pounds of oxygen during stabilization to carbon dioxide. Total Kjeldahl nitrogen (TKN) is the sum of the total unsatisfied nitrogen as both nitrogen and ammonia. Each pound of this material requires 4.57 pounds of oxygen during stabilization to nitrates.

The DO and TOD immediately upstream from the mouth of Elevenmile Creek were 0.9 mg/l and 176 mg/l, respectively. The DO and TOD in Bayou Marcus Creek were 4.7 mg/l and 12.7 mg/l, respectively. In the Perdido River upstream from the mouth, DO and TOD values were 7.1 and 11.6 mg/l, respectively. Flows from Bayou Marcus Creek and Perdido River apparently did not depress DO concentrations in the bay.

During the September 1969 survey, average surface DO concentrations ranged from 7.0 mg/l to 8.0 mg/l in most of the bay and lower Perdido River. Only near the mouth of Elevenmile Creek were the surface DO concentrations less than 4 mg/l. The slightly higher DO concentrations measured in 1969 were probably a result of analyzing aerated surface samples. In 1972, DO samples were collected at 5 feet in water equal to or greater than ten feet deep or at mid-depth in water less than 10 feet deep. In general, the DO in the bay has not changed significantly in the last three years.

Biochemical Oxygen Demand

Five-day biochemical oxygen demand (BOD_5) concentrations (1.0-1.5 mg/l) at six bay locations reflected background conditions -- unpolluted or very low pollution level conditions. One of the lowest BOD_5 concentrations (1 mg/l) found during the survey was measured near the mouth of Elevenmile Creek (Station P-2). However, the TOD at Station P-2 was 22.3 mg/l, reflecting the waste flow from Elevenmile Creek. The BOD_5 measured in the mouth of Perdido River was 2 mg/l -- the highest measurement in the bay area except for Elevenmile Creek. Perdido River contributed

26 percent of the BOD_5 measured entering the bay (Table VIII).

Bacteriological

Perdido Bay, Perdido River, Elevenmile Creek, and Bayou Marcus Creek were sampled to determine bacteriological water quality. A summary of the coliform bacteria data is contained in Table XII. Figure 6 shows the total coliform distribution observed in Perdido Bay during the study period. There is a gradual decrease in mean total coliform densities from the upper portion to the lower portion of the bay. The highest mean total coliform density measured (490/100 ml) was near the mouth of Elevenmile Creek (Station P-2). The higher total coliform densities observed at this station reflected the influence of the waste in Elevenmile Creek. The mean total coliform density of 310/100 ml observed at Station P-4 is probably due to the Perdido River discharge. The impact of the Bayou Marcus discharge on the bacteriological quality of Perdido Bay was not apparent at Station P-7, the station closest to the mouth of the bayou. The mean total coliform density at this station was 120/100 ml.

Only at Station P-2 did the total coliform density exceed Florida's Class III water quality bacterial criteria for body contact activities. The coliform criteria requirement specifies that the monthly average not exceed 1,000/100 ml and that individual daily sample not exceed 2,400/100 ml. The arithmetic average for station P-2 was 1,300/100 ml; the maximum individual daily measurement was 4,300/100 ml.

The total coliform limit for shellfish harvesting of 70/100 ml as set by the National Shellfish Sanitation Program was not met in the upper portion of the bay.

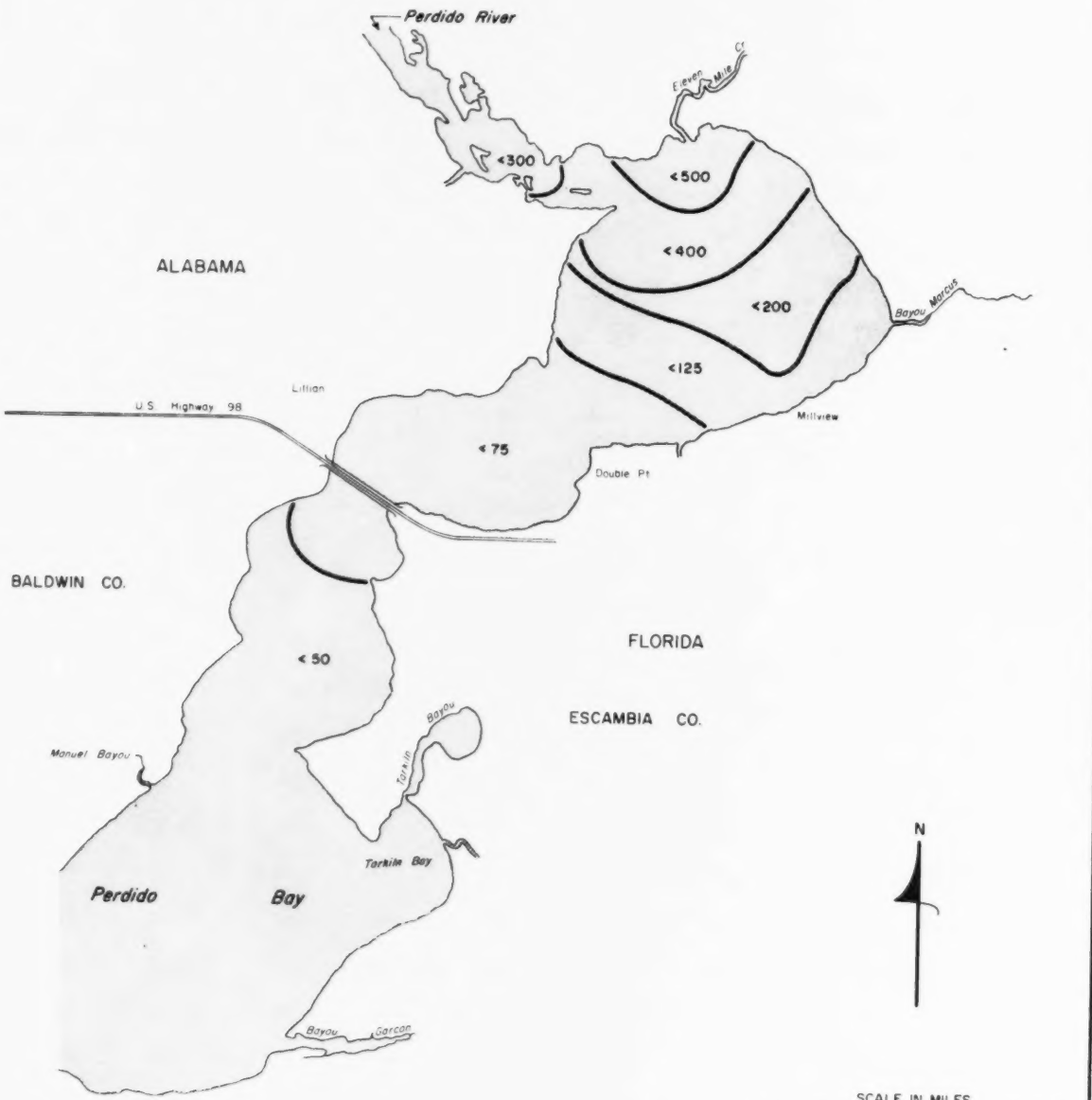
TABLE XII

PERDIDO BAY AND TRIBUTARY BACTERIOLOGICAL DATA SUMMARY
JUNE 1972

EPA Sta. No.	Total Coliform Bacteria/100 ml				Fecal Coliform Bacteria/100 ml				No. of Samples
	Maximum	Minimum	Average	Log Mean	Maximum	Minimum	Average	Log Mean	
P-1	1,100	20	450	290	70	<20	26	23	8
P-2	4,300	60	1,300	490	50	<20	26	24	5
P-3	1,700	50	540	270	20	<20	20	20	5
P-4	1,300	70	550	310	80	<20	32	26	5
P-5	790	140	400	330	70	<20	37	27	4
P-6	1,300	<20	470	200	20	<20	20	20	5
P-7	330	40	170	120	20	<20	20	20	5
P-8	490	50	170	120	20	<20	20	20	5
P-9	490	<20	180	120	110	<20	44	34	5
P-10	330	50	210	180	20	<20	20	20	5
P-11	700	<20	180	59	170	<20	50	31	5
P-12	80	20	44	35	20	<20	20	20	5
P-13	790	<20	190	59	220	<20	60	32	5
P-14	330	20	110	68	170	<20	50	31	5
P-15	130	<20	54	38	50	<20	26	24	5
P-16	330	<20	82	35	130	<20	42	29	5
PR-1	4,900	40	2,000	970	790	40	180	110	7
B-1	350,000	4,900	77,000	29,000	170,000	330	25,000	2,300	7
EM-1	92,000	4,900	25,000	15,000	700	50	310	240	7
EM-2	22,000	2,000	9,300	7,000	1,700	20	470	230	7
EM-3	92,000	330	18,000	5,300	2,800	20	660	310	7
EM-4	92,000	1,300	31,000	11,000	330	50	130	110	8

FIGURE 6

TOTAL COLIFORM BACTERIA DISTRIBUTION



NOTE: Bacteria Distribution - Logarithmic Mean M.P.N. / 100 ml

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Fecal coliform densities were generally low throughout the bay. All bay stations had mean fecal coliform densities of less than 35/100 ml. The fecal coliform bacteria were within Alabama's specific Water Quality Criteria for Swimming and Other Whole Body Water-Contact Sports (Table III).

Lignin-like Compounds and Color

Lignin-like compounds are a major constituent of paper mill wastes. During the survey, the discharge of lignin-like compounds from the St. Regis paper mill averaged 17,400 pounds per day. The mill discharge represents 97 percent of the total lignin-like compounds measured in the discharge into the bay. Concentrations of lignin-like compounds were determined in Perdido Bay to trace the waste distribution from Elevenmile Creek (Table IX).

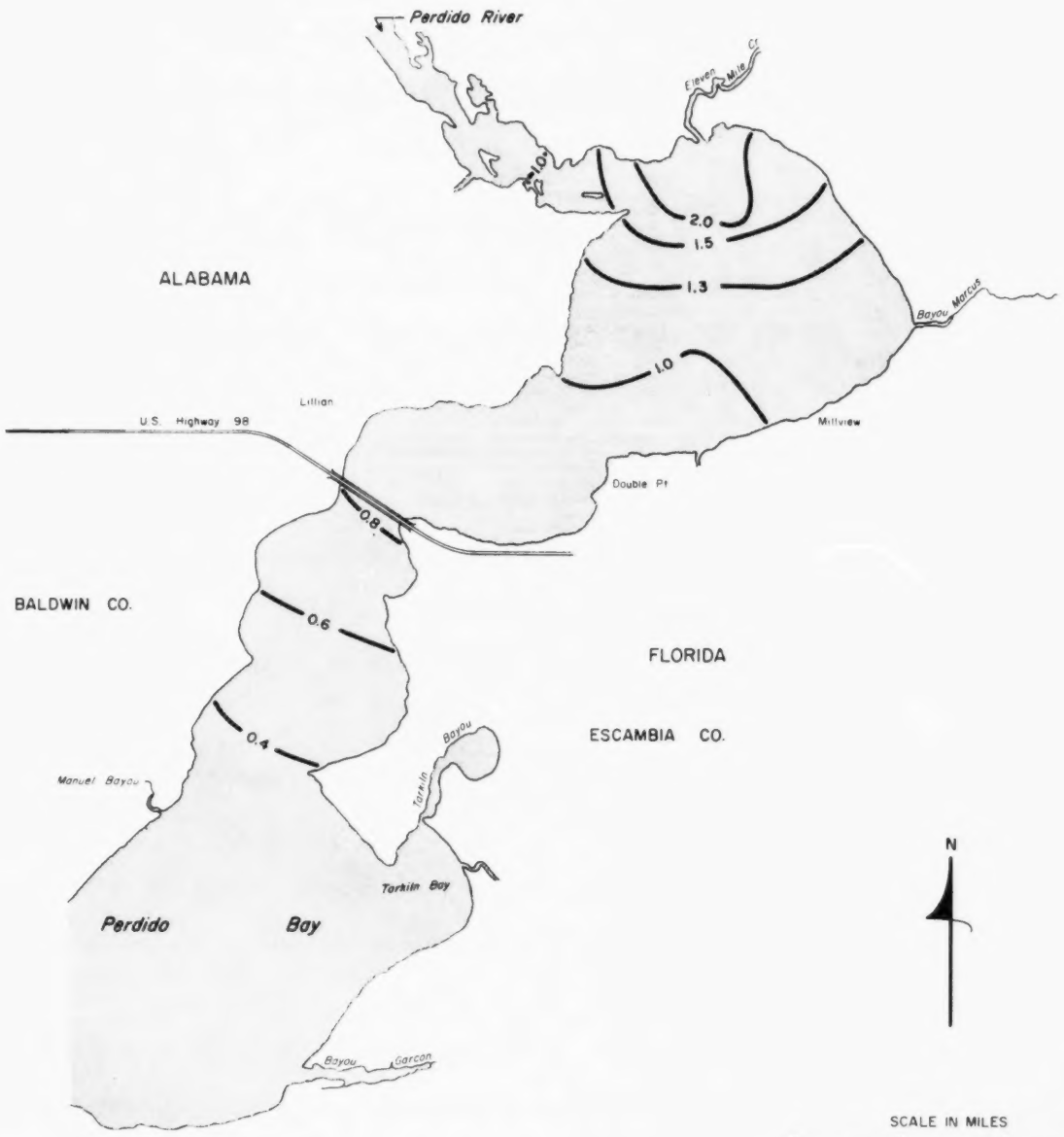
Lignin-like compounds were diluted from 38 mg/1 in Elevenmile Creek near the mouth (Station EM-4) to 2.7 mg/1 in samples collected in Perdido Bay 0.25 mile south of Elevenmile Creek (Station P-2). Figure 7 shows that:

- Elevenmile Creek was the primary source of lignin in the bay.
- Concentrations decrease progressively toward the mouth of the bay.
- Concentrations are above background (0.4 mg/1) to a point 2 miles south of U. S. Highway 98 bridge (Station 16).

Lignin-like compounds impart a dark color to paper processing waste effluents (color in St. Regis' effluent was 1,100 Pt.-Co. units). Color determinations on the same samples analyzed for lignin-like

FIGURE 7

LIGNIN LIKE COMPOUNDS CONCENTRATIONS



NOTE: Lignin - mg/l

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compounds indicated a similar distribution of values, ranging from 67 Pt.-Co. units near the mouth of Elevenmile Creek to 21 units at Station P-16 in the lower bay (Figure 8). All color concentrations in Perdido Bay north of Double Point were above the background level of 33 units measured in the Perdido River at the control station PR-1.

Florida and Alabama's water quality criteria stipulate that color not be a nuisance and that it not interfere with normal assigned water uses. "Nuisance" and "assigned water uses" are not defined and it can't be stated whether or not the color levels measured exceeded adopted water quality criteria.

In 1969, higher lignin-like compound concentrations (9.7 mg/1) were measured in the bay near the mouth of Elevenmile Creek. The concentrations decreased from the upper to lower portion of the bay averaging 1 mg/1 near the U. S. Highway 98 bridge. Color concentrations in 1969 were also slightly higher (27-100 units) throughout the bay.

Nitrogen

Elevenmile Creek contributed 67 percent of the total Kjeldahl nitrogen (TKN), 61 percent of the ammonia nitrogen, and 50 percent of the measured nitrate-nitrite nitrogen entering the bay (Table VIII). The maximum TKN concentrations (0.2-0.3 mg/1) were in the north and northeast sections of the bay, reflecting the waste in the Elevenmile Creek discharge (Figure 9). Saufley Field also discharges into the northeast section of the bay, but the waste flow (0.16 MGD) had a negligible measurable effect on water quality in the bay. This northeast area of the bay was similarly affected in 1969; however, the concentrations were about 0.7 mg/1.

FIGURE 8

COLOR CONCENTRATIONS

NOTE: Color as - Pt. Co. Units

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FIGURE 9

TOTAL KJELDAHL NITROGEN CONCENTRATIONS

NOTE: TKN-mg/l

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TKN concentrations exceeding 0.23 mg/l were measured near Bayou Marcus Creek. (Bayou Marcus contributed 12 percent of the TKN, 30 percent of the ammonia, and one percent of the measured nitrite-nitrate nitrogen). In 1969, the TKN concentrations measured at this station were about 0.3 mg/l.

TKN concentrations of 0.22 mg/l hugging the western shore of upper Perdido Bay reflected the 20 percent measured nitrogen contribution from the Perdido River. In 1969, the lowest concentrations found in the bay (0.16-0.20 mg/l) were in this area.

The highest average ammonia and nitrite-nitrate concentrations of 0.04 and 0.03 mg/l, respectively, were measured in Perdido Bay near the mouth of Elevenmile Creek (Station P-2). These concentrations result from the waste flow from Elevenmile Creek. In the remainder of the bay, concentrations of both parameters varied between 0.02 and <0.01 mg/l and no distribution pattern was detected. In 1969, ammonia nitrogen concentrations ranged from 0.04 mg/l near the mouth of Elevenmile Creek to 0.02 mg/l at the U. S. Highway 98 bridge. Nitrite-nitrate concentrations in 1969 were about the same as in 1972.

The nitrogen concentrations in the upper reaches of the bay have not attained nuisance levels; however, if nitrogen loads continue to be discharged at the present rates, over-enrichment could occur.

Total Phosphorus

Total phosphorus concentrations of 0.05 mg/l measured in the northeast section of the bay reflected St. Regis' discharge of 48 percent (220 pounds per day) of the total measured phosphorus input into the bay.

This was the highest concentration measured in the bay and the affected area extended from Elevenmile Creek to within 1/2 mile of Bayou Marcus Creek (Figure 10). Bay concentrations diminished gradually from the upper to lower portion of the bay, reaching background levels (0.02 mg/1) near the U. S. Highway 98 bridge.

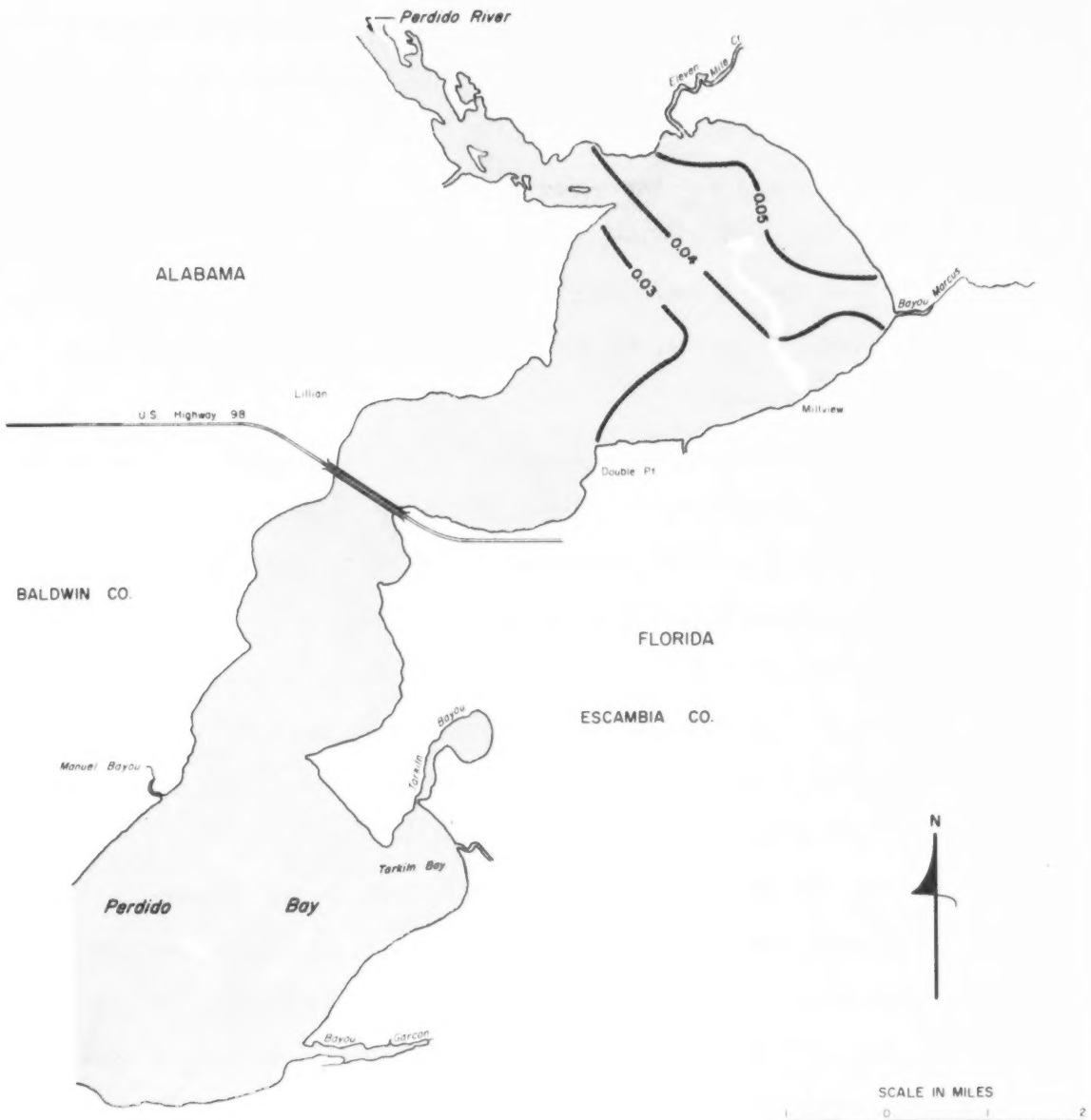
The four municipal wastewater treatment plants which discharge into Bayou Marcus Creek contributed 31 percent (151 pounds per day) of the total phosphorus input into the bay. This contribution is reflected in the phosphorus content (0.04 to 0.05 mg/1) observed near the mouth of Bayou Marcus Creek.

In 1969, the wastewater treatment plants discharging into Bayou Marcus Creek contributed 55 percent (106 pounds per day) of the total phosphorus; St. Regis contributed 45 percent (87 pounds per day). Because of the significantly greater flow from Elevenmile Creek, the highest phosphorus concentrations were measured in this area. In 1972, total phosphorus concentrations in the immediate vicinity of Elevenmile and Bayou Marcus Creeks were about the same as values observed in 1969, but the affected areas were generally smaller.

During the 1972 survey, Perdido River contributed 17 percent (77 pounds per day) of the total phosphorus measured in discharges into the bay. Because of the low levels of phosphorus concentrations in the river, the effects of this discharge on the bay are not readily apparent. The concentration near the mouth of the river was 0.02 mg/1 which indicates that the slightly greater concentrations observed in the bay were not due to the contribution of phosphorus from the river.

FIGURE 10

TOTAL PHOSPHOROUS CONCENTRATIONS



NOTE Total Phosphorous - mg/l as P

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Although biological nuisances have been observed in areas with total phosphorus concentrations of 0.05 mg/l (3), none were observed during this study. However, if discharges from the St. Regis and the municipal wastewater treatment plants continue at the present rate, nuisance conditions could evolve.

Total Organic Carbon

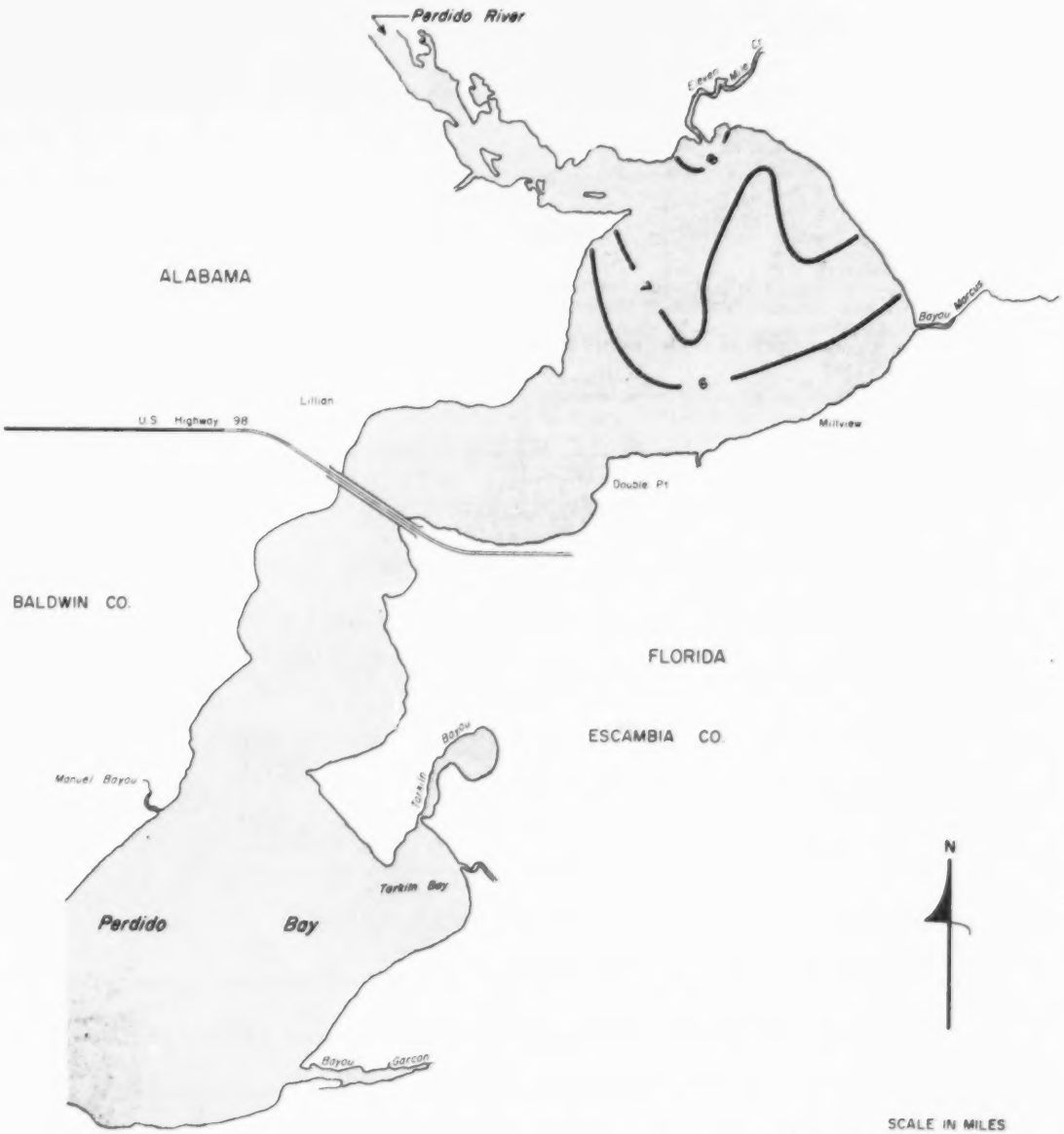
Eighty-six percent of the measured total organic carbon (TOC) input into Perdido Bay was discharged by the paper mill operated by the St. Regis Paper Company. Results of the TOC in the paper mill discharge are reflected by the 8 mg/l concentration observed at Station P-2. Concentrations decreased progressively down the bay (Figure 11); the concentration at the U. S. 98 bridge was 5 mg/l. The 13 percent input from Perdido River and the one percent contributed from Bayou Marcus Creek was not apparent in the bay. In 1969, the TOC concentrations ranged from 13 mg/l at the mouths of Elevenmile and Bayou Marcus Creeks to 4 mg/l near the U. S. Highway 98 bridge.

Foam

During the entire survey period, which included some very windy days (gusts up to 35 mph), no foam was sighted on the bay, along its shores, in the mouths of Elevenmile and Bayou Marcus Creeks or the Perdido River. The only foam seen was immediately downstream from the paper mill at Kings Field Road. Foam was not observed at any of the Elevenmile Creek sampling stations.

FIGURE 11

TOTAL ORGANIC CARBON CONCENTRATIONS



NOTE Total Organic Carbon - mg/l

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV

PERDIDO BAY
WATER QUALITY SURVEY
JUNE, 1972

SURVEILLANCE AND ANALYSIS DIVISION
ATHENS GEORGIA

REFERENCES

1. Effects of Pollution on Water Quality, Perdido River and Bay, Alabama and Florida, U. S. Department of the Interior, Federal Water Pollution Control Administration, Southeast Water Laboratory, Athens, Georgia, January 1970.

2. Supplement to Effects of Pollution on Water Quality, Perdido River and Bay, Alabama and Florida, Environmental Protection Agency, Southeast Water Laboratory, Athens, Georgia, February 1971.

3. The Practice of Water Pollution Biology, U. S. Department of the Interior, Federal Water Pollution Control Administration, Washington, D. C., September 1969.

APPENDICES

APPENDIX A

ACKNOWLEDGMENT AND PROJECT PERSONNEL

ACKNOWLEDGMENT AND PROJECT PERSONNEL

The cooperation and resources extended to the Environmental Protection Agency by employees of the Florida State Board of Health. Appreciation is also extended to each of the municipal and industrial dischargers which assisted in sampling and/or flow measuring of their wastewater treatment plants.

EPA Field Personnel

Dick Baird - Sanitary Engineer

Tom Bennett - Chemist

Jerry Burger - Engineering Aide

Bobby Carroll - Microbiologist

Ralph Gentry - Microbiologist

Steve Hall - Sanitary Engineer

Wade Knight - Chemist

Pat Lawless - Chemist

Tom Sack - Physical Science Technician

Eddie Shollenberger - Engineering Technician

Ron Weldon - Biologist

APPENDIX B

SAMPLING PROCEDURES AND ANALYTICAL METHODS

SAMPLING PROCEDURES AND ANALYTICAL METHODS

SAMPLING PROCEDURES

Municipal Waste Discharges

Twenty-four hourly composite samples using Serco automatic samplers (Sigmamotor or Protech used at a few plants) were collected at the influent and effluent (effluent prior to chlorination) of each wastewater treatment plant for pH, BOD_5, TOC, COD, total suspended solids, total volatile suspended solids, nitrogen series, and total phosphorus analyses. Grab samples for total and fecal coliform analyses were collected hourly for 12 hours and composited every three hours. Chlorine residual was measured in the field; pH was measured in the field laboratory. Flows were determined by plant equipment and/or records or EPA equipment.

Industrial Waste Discharges

St. Regis Paper Company -- Twenty-four hourly composite samples were collected at the influent and effluent of the company's wastewater treatment plant for seven days. Company automatic samplers (paddle-wheel type) were used and were refrigerated. Analyses required were pH, temperature, BOD_5, TOC, COD, total suspended solids, total volatile suspended solids, lignin-like compounds, color, nitrogen series, and total phosphorus. Total and fecal coliform samples were collected by grabbing. All samples were refrigerated during transport to the field laboratory. Temperatures were measured in the field; pH was measured in the field laboratory. Flows were measured with company Parshall

flumes. (A complete description of the study procedures is included in the separate report evaluating St. Regis' treatment system.)

Newport Division, Tenneco Chemicals, Inc. -- One 24-hour composite sample was collected at the effluent from the wastewater treatment system with a Serco automatic sampler for the following analyses: pH, BOD_5, COD, total suspended solids, total volatile suspended solids, total solids, total dissolved solids and total phosphorus. Samples for oil and grease, phenols, and organic scan analyses were hand grabbed. Flow was determined by company equipment.

The composite sample was refrigerated while being collected; all samples were refrigerated while transported to the field laboratory.

Baldwin Pole and Piling Company -- Grab samples for the following analyses were collected:

- BOD_5, COD, total solids, total suspended solids, total volatile solids, color -- one grab.
- Phenols -- one grab.
- Organic scan -- one grab.

Waste flow was estimated by the company.

Perdido Bay and Tributary Streams

Fifteen bay and seven tributary stations were grab sampled once daily for five and seven consecutive days, respectively. Sampling times were varied to account for diurnal fluctuations. A tide gage was installed near the mouth of Perdido River to record tidal variations. Tributary stations were sampled concurrently with St. Regis sampling;

bay stations were sampled for five days.

The following analyses were run on the samples from all stations: pH, temperature, BOD_5, TOC, color, lignin-like compounds, dissolved oxygen, and total and fecal coliform. Total suspended solids and total volatile suspended solids were run on tributary streams only; COD was run on only freshwater samples. Nitrogen series, total P, and conductivity were run on all the bay stations, the two Perdido River stations and the stations at the mouths of Elevenmile and Bayou Marcus Creeks. Chlorides were run on the Bayou Marcus Creek and three bay stations.

All samples except those for coliform analyses were collected at mid-depth in water less than 10 feet deep and at 5 feet in water greater than 10 feet deep. Samples for coliform analyses were collected at the surface. A DO can sampler was used when sampling from a bridge for samples for chemical analyses; samples for total and fecal coliform analyses were collected by tying a string to a sterile "Bacti" bottle and lowering it into the water. A Kemmerer sampler was used to collect chemistry samples when sampling from a boat; coliform samples were collected by hand-dipping the sterile "Bacti" bottle.

Temperature was measured at time of sample collection; pH was measured in the field laboratory. Dissolved oxygen samples were fixed immediately after collection by adding manganous sulfate and alkali azide reagent. All samples were refrigerated upon collection and kept cool while being transported to the field laboratory.

The 15 Perdido Bay stations were located by first establishing a base line on a magnetic south heading from the mouth of Elevenmile

Creek. This was done by running the boat south at a constant speed to determine the time from the mouth to the opposite shore -- a known distance. The base line buoys were placed using this calculated velocity and the location description (Table X); the remaining buoys were then located with this base line as a reference.

ANALYTICAL METHODS

The following analytical methods were used by EPA personnel:

Parameter	Method	Reference
Biochemical Oxygen Demand	Winkler DO, 5-day	1,2
Chemical Oxygen Demand	Acid-dichromate Oxidation	2
Total Organic Carbon	Carbon Analyzer	2
Suspended Solids	Gravimetric	1
Color	Visual Against Co.-Pt. Standard	1
Lignin-like Compounds	Tungsto-molybdo-phosphoric Acid	1
Total Kjeldahl Nitrogen	Automated Phenolate Method	2
Ammonia	Automated Phenolate Method	2
Nitrate-Nitrite	Copper-cadmium Reduction, Automated	2
Phosphorus	Ascorbic Acid Method	2
Settleable Solids	Volumetric	1
Dissolved Oxygen	Winkler	1
Conductivity	Conductivity Bridge	1
Chlorides	Automated Ferricyanide	2
Oil & Grease	Solvent Extraction	1
Phenols	4-Aminoantipyrine	1
Total Solids	Gravimetric, 105^{o}C	1
Dissolved Solids	Difference between Total and Suspended Solids	-

Parameter	Method	Reference
pH	Electrometric	1
Total Coliform	MPN	1
Fecal Coliform	MPN	1
Organic Scan	SEWL	-

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1. Standard Methods for Examination of Water and Wastewater, 13th Edition, 1971.

2. EPA Manual of Methods for Chemical Analyses of Water and Wastes, 1971.

APPENDIX C

SAMPLING STATION LOCATIONS

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

AGENCY PRIMARY STATION	SECONDARY	SECONDARY	STATION LOCATION	STATE	MINOR BASIN
11135000					
640078	P-01	F-033-A26	PERDIDO RIVER AT MOUTH	FLORIDA	PERDIDO RIVER BASIN
640084	P-02	F-033-A28	PERDIDO BAY-.25 NAU.MI S 11 MI C	FLORIDA	PERDIDO RIVER BASIN
640087	P-03	F-033-A29	PERDIDO BAY-0.5 NAU.MI E OF P-02	FLORIDA	PERDIDO RIVER BASIN
017000	P-04	A-003-32	PERDIDO BAY-0.5 NAU.MI.W OF P-05	ALABAMA	PERDIDO RIVER BASIN
017003	P-05	A-003-33	PERDIDO BAY-1 NAU.MI. S 11 MI CR	ALABAMA	PERDIDO RIVER BASIN
640090	P-06	F-033-A30	PERDIDO BAY-.75 NAU.MI E OF P-05	FLORIDA	PERDIDO RIVER BASIN
640093	P-07	F-033-A31	PERDIDO BAY-.5 NAU MI W BAYOU MA	FLORIDA	PERDIDO RIVER BASIN
017006	P-08	A-003-34	PERDIDO BAY-.75 NAU MI W OF P-09	ALABAMA	PERDIDO RIVER BASIN
640096	P-09	F-033-A32	PERDIDO BAY-1.75 NAU MI S 11MI C	FLORIDA	PERDIDO RIVER BASIN
640099	P-10	F-033-A33	PERDIDO BAY-.75 NAU MI E OF P-09	FLORIDA	PERDIDO RIVER BASIN
640102	P-11	F-033-A34	PERDIDO BAY-.7 NAU MI SW OF P-09	FLORIDA	PERDIDO RIVER BASIN
640105	P-12	F-033-A35	PERDIDO BAY-.75 NAU MI W OF P-11	FLORIDA	PERDIDO RIVER BASIN
017009	P-13	A-003-35	PERDIDO BAY-1.5 NAU MI W OF P-11	ALABAMA	PERDIDO RIVER BASIN
017012	P-14	A-003-36	PERDIDO BAY-US 98 BRIDGE-MIDDLE	ALABAMA	PERDIDO RIVER BASIN
640108	P-15	F-033-A36	PERDIDO BAY-1 MI S OF US 98 BR.	FLORIDA	PERDIDO RIVER BASIN
640111	P-16	F-033-A37	PERDIDO BAY-2 MI S OF US 98 BR.	FLORIDA	PERDIDO RIVER BASIN
640075	PR-01	F-033-A25	PERDIDO RIVER AT FLA. HWY. 184	FLORIDA	PERDIDO RIVER BASIN
640081	B-01	F-033-A27	BAYOU MARCUS CREEK AT MOUTH	FLORIDA	PERDIDO RIVER BASIN
640063	EM-01	F-033-A21	ELEVEN MILE CR. AT ST. RT. 297A	FLORIDA	PERDIDO RIVER BASIN
640066	EM-02	F-033-A22	ELEVEN MILE CR. AT US 90A-SR 10	FLORIDA	PERDIDO RIVER BASIN
640069	EM-03	F-033-A23	ELEVEN MILE CR. AT US 90-SR 10A	FLORIDA	PERDIDO RIVER BASIN
640072	EM-04	F-033-A24	ELEVEN MILE CR. AT MOUTH	FLORIDA	PERDIDO RIVER BASIN
640042	SR-03	F-033-A14	ST. REGIS PAPER CO-PRIMRY PD INF	FLORIDA	PERDIDO RIVER BASIN
640054	SR-07	F-033-A18	ST. REGIS PAPER CO.-FINAL EFF.	FLORIDA	PERDIDO RIVER BASIN
640000	LP-01	F-033-A	LINCOLN PARK STP INFLUENT	FLORIDA	PERDIDO RIVER BASIN
640003	LP-02	F-033-A1	LINCOLN PARK STP EFFLUENT	FLORIDA	PERDIDO RIVER BASIN
640006	MA-01	F-033-A2	MAYFAIR STP INFLUENT	FLORIDA	PERDIDO RIVER BASIN
640009	MA-02	F-033-A3	MAYFAIR STP EFFLUENT	FLORIDA	PERDIDO RIVER BASIN
640012	MO-01	F-033-A4	MONTCLAIR STP INFLUENT	FLORIDA	PERDIDO RIVER BASIN
640015	MO-02	F-033-A5	MONTCLAIR STP EFFLUENT	FLORIDA	PERDIDO RIVER BASIN
640018	S-01	F-033-A6	SAUFLEY FIELD STP INFLUENT	FLORIDA	PERDIDO RIVER BASIN
640021	S-02	F-033-A7	SAUFLEY FIELD STP EFFLUENT	FLORIDA	PERDIDO RIVER BASIN
640024	FM-01	F-033-A8	FAIRWAY MOBILE HOME COURT INF.	FLORIDA	PERDIDO RIVER BASIN
640027	FM-02	F-033-A9	FAIRWAY MOBILE HOME COURT EFF.	FLORIDA	PERDIDO RIVER BASIN
640030	AV-01	F-033-A10	AVONDALE STP INFLUENT	FLORIDA	PERDIDO RIVER BASIN
640033	AV-02	F-033-A11	AVONDALE STP EFFLUENT	FLORIDA	PERDIDO RIVER BASIN
017015	AT-01	A-053-23	ATMORE STP INFLUENT	ALABAMA	PERDIDO RIVER BASIN
017018	AT-02	A-053-24	ATMORE STP EFFLUENT	ALABAMA	PERDIDO RIVER BASIN
017021	FO-01	A-003-37	FOLEY STP INFLUENT	ALABAMA	PERDIDO RIVER BASIN
017024	FO-02	A-003-38	FOLEY STP EFFLUENT	ALABAMA	PERDIDO RIVER BASIN
017027	RO-01	A-003-39	ROBERTSDALE STP INFLUENT	ALABAMA	PERDIDO RIVER BASIN
017030	RO-02	A-003-40	ROBERTSDALE STP EFFLUENT	ALABAMA	PERDIDO RIVER BASIN
017036	TE-01	A-003-42	TENNECO CHEMICALS INC. EFFLUENT	ALABAMA	PERDIDO RIVER BASIN
017039	BA-01	A-003-43	BALDWIN POLE AND PILING CO. EFF.	ALABAMA	PERDIDO RIVER BASIN
017033	BM-01	A-003-41	BAY MINETTE STP EFFLUENT	ALABAMA	PERDIDO RIVER BASIN

APPENDIX D

WATER QUALITY DATA

MUNICIPAL AND INDUSTRIAL WASTE SOURCES

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L
AV-01	720607	1110				28.0						
AV-01	720607	1210				28.0						
AV-01	720607	0800	(C) 720608	0800			6.5	17.20	27.000	0.010K	13.000	
AV-02	720607	0800				26.5						
AV-02	720607	1105				28.5						
AV-02	720607	1205				29.5						
AV-02	720607	0800	(C) 720608	0800			7.2	11.80	16.500	0.020	13.300	40.0

STATION	DATE	TIME	DATE	TIME	DEPTH	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	50050 CONDUIT FLO# MGD	50060 CHLORINE TOT RESD MG/L
AV-01	720607	0720	(C) 720607	0855		.110E+09	46000000				0.460	
AV-01	720607	1110									0.460	
AV-01	720607	1210									0.460	
AV-01	720607	1005	(C) 720607	1210		.220E+09	49000000				0.460	
AV-01	720607	1345	(C) 720607	1455		24000000L	24000000L				0.460	
AV-01	720607	1700	(C) 720607	1745		24000000L	24000000L				0.460	
AV-01	720607	0800	(C) 720608	0800				462	120	100	0.460	
AV-02	720607	0725									0.460	1.50L
AV-02	720607	0800									0.460	1.50L
AV-02	720607	0850									0.460	1.50L
AV-02	720607	0725	(C) 720607	0850		200	200K				0.460	
AV-02	720607	1105									0.460	1.40
AV-02	720607	1205									0.460	1.40
AV-02	720607	1025	(C) 720607	1205		800	200K				0.460	
AV-02	720607	1400									0.460	1.30
AV-02	720607	1500									0.460	1.00
AV-02	720607	1335	(C) 720607	1500		1100	200K				0.460	
AV-02	720607	1600				2300	200K				0.460	1.00
AV-02	720607	0800	(C) 720608	0800				232	70	64	0.460	

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SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME		DATE	TIME	DEPTH	00010 WATER TEMP CENT	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML
MA-01	720606	1000					29.0							
MA-01	720606	1000	(C)	720606	1205									.110E+09
MA-01	720606	1300	(C)	720606	1500									.110E+09
MA-01	720606	1600	(C)	720606	1800									79000000
MA-01	720607	0700	(C)	720607	0900									79000000
MA-01	720606	1400	(C)	720607	1000			7.0	20.80	30.000	0.010	17.600	57.0	
MA-02	720606	1000					27.5							
MA-02	720606	1000	(C)	720606	1200									22000
MA-02	720606	1300	(C)	720606	1500									2300
MA-02	720606	1600	(C)	720606	1800									9200000
MA-02	720607	0700	(C)	720607	0900									2400000L
MA-02	720606	1400	(C)	720607	1000			7.3	8.00	28.500	0.450	18.800	35.0	

STATION	DATE	TIME		DATE	TIME	DEPTH	31615 FEC COLI MPNECMED /100ML	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	50050 CONDUIT FLOW MGD	50060 CHLORINE TOT RESD MG/L
MA-01	720606	1000										0.085	
MA-01	720606	1000	(C)	720606	1205		17000000					0.085	
MA-01	720606	1300	(C)	720606	1500		23000000					0.085	
MA-01	720606	1600	(C)	720606	1800		17000000					0.085	
MA-01	720607	0700	(C)	720607	0900		14000000					0.085	
MA-01	720606	1400	(C)	720607	1000				541	180	140	0.085	
MA-02	720606	1000										0.085	5.00
MA-02	720606	1110										0.085	4.00
MA-02	720606	1200										0.085	4.00
MA-02	720606	1000	(C)	720606	1200		4600					0.085	
MA-02	720606	1300										0.085	4.00
MA-02	720606	1400										0.080	4.00
MA-02	720606	1500										0.109	4.50
MA-02	720606	1300	(C)	720606	1500		2300					0.094	
MA-02	720606	1600										0.101	4.00
MA-02	720606	1700										0.094	0.15
MA-02	720606	1800										0.101	0.15
MA-02	720606	1600	(C)	720606	1800		3500000					0.099	
MA-02	720607	0700	(C)	720607	0900		920000					0.106	
MA-02	720606	1400	(C)	720607	1000				335	56	36	0.085	

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	31505 TOT COLI MPN CONF /100ML
FM-01	720605	1400				28.0						
FM-01	720605	1515				28.0						
FM-01	720605	1605				28.5						
FM-01	720605	1400	(C)720605	1605								92000000
FM-01	720605	1700				29.0						
FM-01	720605	1800				28.5						
FM-01	720605	1900				28.0						
FM-01	720605	1400	(C)720605	1900			7.4	17.20	27.000	0.010K	8.200	.160E+09
FM-02	720605	1400				28.0						
FM-02	720605	1520				28.0						
FM-02	720605	1605				28.0						
FM-02	720605	1400	(C)720605	1605								230000
FM-02	720605	1700				28.0						
FM-02	720605	1800				28.5						
FM-02	720605	1900				27.0						
FM-02	720605	1400	(C)720605	1900			6.9	4.50	10.000	2.040	12.500	23000

STATION	DATE	TIME	DATE	TIME	DEPTH	31615 FEC COLI MPNECMED /100ML	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	50050 CONDUIT FLOW MGD	50060 CHLORINE TOT RESD MG/L
FM-01	720605	1400									0.017	
FM-01	720605	1515									0.017	
FM-01	720605	1605									0.017	
FM-01	720605	1400	(C)720605	1605		17000000					0.017	
FM-01	720605	1700									0.017	
FM-01	720605	1800									0.017	
FM-01	720605	1900									0.017	
FM-01	720605	1400	(C)720605	1900		92000000	306.0	334	81	70	0.017	
FM-02	720605	1400									0.017	1.50
FM-02	720605	1520									0.017	1.30
FM-02	720605	1605									0.017	1.30
FM-02	720605	1400	(C)720605	1605		49000					0.017	
FM-02	720605	1700									0.017	0.90
FM-02	720605	1800									0.017	0.70
FM-02	720605	1900									0.017	0.70
FM-02	720605	1400	(C)720605	1900		7900	170.0	82	31	24	0.017	

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME		DATE	TIME	DEPTH	00010 WATER TEMP CENT	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML
MO-01	720605	1330					28.5							.240E+09L
MO-01	720605	1450					28.5							.240E+09L
MO-01	720605	1550					28.5							35000000
MO-01	720606	0800					28.0							.170E+09
MO-01	720606	0900					28.0							.130E+09
MO-01	720605	1300	(C)	720606	1300			7.1	20.60	28.500	0.010K	16.700	150.0	
MO-01	720606	1400												.130E+09
MO-02	720605	1330					28.5							200K
MO-02	720605	1450					28.5							200K
MO-02	720605	1550					28.5							200K
MO-02	720606	0800					28.0							50
MO-02	720606	0900					28.0							20K
MO-02	720605	1300	(C)	720606	1300			7.3	16.00	19.800	0.090	16.000	48.0	
MO-02	720606	1400												20K

STATION	DATE	TIME		DATE	TIME	DEPTH	31615 FEC COLI MPNECMED /100ML	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	50050 CONDUIT FLO# MGD	50060 CHLORINE TOT RESD MG/L
MO-01	720605	1330					54000000					0.580	
MO-01	720605	1450					35000000					0.580	
MO-01	720605	1550					35000000					0.580	
MO-01	720606	0800					17000000					0.580	
MO-01	720606	0900					33000000					0.580	
MO-01	720605	1300	(C)	720606	1300			204.0	529	180	170	0.580	
MO-01	720606	1400					49000000					0.560	
MO-02	720605	1330					200K					0.490	1.50L
MO-02	720605	1450					200K					0.350	3.50
MO-02	720605	1550					200K					0.350	6.00
MO-02	720606	0800					20K					0.360	6.00
MO-02	720606	0900					20K					0.500	6.00
MO-02	720605	1300	(C)	720606	1300			62.0	199	44	44	0.580	
MO-02	720606	1400					20K					0.320	5.00

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME		DATE	TIME	DEPTH	00010 WATER TEMP CENT	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L
S-01	720607	1630					29.0						
S-01	720608	1030					31.5						
S-01	720608	1130					31.5						
S-01	720608	1230					32.0						
S-01	720607	1400	(C)	720608	1230			6.4	8.40	19.000	0.020	6.900	
S-02	720607	1635					29.0						
S-02	720608	0830					28.0						
S-02	720608	0935					28.5						
S-02	720608	1035					29.0						
S-02	720608	1135					29.5						
S-02	720607	1400	(C)	720608	1230			6.3	2.90	7.500	6.500	6.900	46.0
S-02	720608	1235					29.5						

STATION	DATE	TIME		DATE	TIME	DEPTH	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	50050 CONDUIT FLOW MGD	50060 CHLORINE TOT RESD MG/L
S-01	720607	1310	(C)	720607	1430		.240E+09	17000000				0.160	
S-01	720607	1630										0.160	
S-01	720607	1530	(C)	720607	1720		.140E+09	17000000				0.160	
S-01	720608	1030										0.160	
S-01	720608	0825	(C)	720608	1030		.170E+09	.130E+09				0.160	
S-01	720608	1130										0.160	
S-01	720608	1230										0.160	
S-01	720607	1400	(C)	720608	1230		79000000	7900000	556	140	130	0.160	
S-02	720607	1435					80	50				0.160	1.30
S-02	720607	1530										0.160	1.30
S-02	720607	1635										0.160	1.00
S-02	720607	1725										0.160	1.20
S-02	720607	1530	(C)	720607	1725		20	20K				0.160	
S-02	720608	0830										0.160	1.50
S-02	720608	0935										0.160	1.40
S-02	720608	1035										0.160	1.40
S-02	720608	0830	(C)	720608	1035		110	20K				0.160	
S-02	720608	1135										0.160	1.40
S-02	720607	1400	(C)	720608	1230				174	45	41	0.160	
S-02	720608	1235										0.160	1.40
S-02	720608	1135	(C)	720608	1235		110	20				0.160	

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME		DATE	TIME	DEPTH	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML
LP-01	720611	1700	(C)	720612	1700		6.7	21.90	29.000	0.010K	13.000	150.0	
LP-02	720611	1640											16000000
LP-02	720611	1715											24000000L
LP-02	720612	1700											16000000
LP-02	720611	1700	(C)	720612	1700		6.9	19.50	21.500	0.020	12.800	17.0	

STATION	DATE	TIME		DATE	TIME	DEPTH	31615 FEC COLI MPNECMED /100ML	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	50050 CONDUIT FLOW MGD
LP-01	720611	1700	(C)	720612	1700			420.0	1390	250	200	0.080
LP-02	720611	1640					1700000					
LP-02	720611	1715					4300000					
LP-02	720612	1700					9200000					
LP-02	720611	1700	(C)	720612	1700			26.0	84	24	18	0.080

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DATE	TIME	DEPTH	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L
AT-01	720611	1330				6.9	20.00	28.000	0.010K	15.500	
AT-02	720610	1500(C)	720611	1330		6.9	10.60	12.000	1.800	11.900	28.0

STATION	DATE	TIME	DATE	TIME	DEPTH	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	50050 CONDUIT FLOW MGD
AT-01	720611	1330				230.0	422	120	88	0.547
AT-02	720610	1500(C)	720611	1330		37.0	52	28	5K	0.547

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME		DATE	TIME	DEPTH	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	T 00680 ORG C C MG/L
FO-01	720612	1200	(C)	720613	1100		7.3	12.70	19.000	0.010	11.600	24.0
FO-02	720612	1200	(C)	720613	1100		7.3	4.80	7.000	0.040	8.000	30.0

STATION	DATE	TIME		DATE	TIME	DEPTH	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	50050 CONDUIT FLOW MGD
FO-01	720612	1200	(C)	720613	1100		136.0	444	86	60	0.240
FO-02	720612	1200	(C)	720613	1100		23.0	134	17	14	0.240

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME		DATE	TIME	DEPTH	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L
RO-01	720612	1300	(C)	720613	1300		6.5	5.70	13.500	0.300	13.400	92.0
RO-02	720612	1300	(C)	720613	1300		6.5	0.53	1.350	0.950	2.200	10.0

STATION	DATE	TIME		DATE	TIME	DEPTH	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	50050 CONDUIT FLOW MGD
RO-01	720612	1300	(C)	720613	1300		261.0	495	100	82	0.101
RO-02	720612	1300	(C)	720613	1300		13.0	60	14	10	0.101

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SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME		DATE	TIME	DEPTH	00080 COLOR PT-CO UNITS	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L
TE-01	720609	1430	(C)	720610	1330			7.2	0.01K	0.800	0.010K	1.200	340.0	1510
BA-01	720609	1630					300	7.0					59.0	174

STATION	DATE	TIME		DATE	TIME	DEPTH	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	50050 CONDUIT FLOW MGD	32730 PHENOLS UG/L	00500 RESIDUE TOTAL MG/L	00505 RESIDUE TOT VOL MG/L	00515 RESIDUE DISS-105 C MG/L	00550 OIL GRSE TOTAL MG/L
TE-01	720610	1330								515				190.0
TE-01	720609	1430	(C)	720610	1330		120	88	0.156		1230	420	1120	
BA-01	720609	1630					28	20	0.002	9100	140	120	110	

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STATION	DATE	TIME		DATE	TIME	DEPTH	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	50050 CONDUIT FLOW MGD
BM-01	720609	1400	(C)	720610	1400		6.6	14.40	19.000	0.010K	11.500	208.0	530	220	180	0.880

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SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME		DATE	TIME	DEPTH	32240 TANNIN LIGNIN MG/L	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	50050 CONDUIT FLOW MGD	32730 PHENOLS UG/L
SR-03	720605	1415										26.300	
SR-03	720606	0800										26.300	3750
SR-03	720605	0830	(C)	720606	0800		88	223.0	879	220	150	26.300	
SR-03	720606	1330										26.300	
SR-03	720606	0800	(C)	720607	0735					270	170	26.500	
SR-03	720607	0635	(C)	720607	0840							26.500	
SR-03	720607	1125										26.500	1140
SR-03	720607	0935	(C)	720607	1125							26.500	
SR-03	720607	1230	(C)	720607	1430							26.500	
SR-03	720607	1530	(C)	720607	1730							26.500	
SR-03	720608	0640										26.400	
SR-03	720607	0735	(C)	720608	0740		120		970	390	220	26.400	
SR-03	720608	0640	(C)	720608	0840							26.400	
SR-03	720608	1030											625
SR-03	720608	0935	(C)	720608	1125							26.400	
SR-03	720608	1250	(C)	720608	1440							26.400	
SR-03	720608	1535	(C)	720608	1735							26.400	
SR-03	720608	0740	(C)	720609	0755			196.0		130	100	25.500	
SR-03	720609	0835										25.100	870
SR-03	720610	0735										25.100	1130
SR-03	720609	0755	(C)	720610	0735		89	194.0	693	190	130	25.100	
SR-03	720611	0645										26.400	740
SR-03	720610	0735	(C)	720611	0645			235.0		200	150	26.400	
SR-03	720611	0647	(C)	720611	0840							26.400	
SR-03	720611	0940	(C)	720611	1140							26.400	
SR-03	720611	1410	(C)	720611	1610							26.400	
SR-03	720611	1705	(C)	720611	1800							26.400	
SR-03	720611	0645	(C)	720612	0700		84	205.0	772	100	78	26.400	
SR-03	720612	0701										26.400	650
SR-03	720614	0700	(C)	720615	0700		88	199.0	786	280	110	24.500	
SR-03	720615	0700	(C)	720616	0700		78	217.0	775	270	140	25.900	

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ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME		DATE	TIME	DEPTH	00010 WATER TEMP CENT	00080 COLOR PT-CO UNITS	00403 LAB PH SU	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML
SR-03	720605	1415					36.0					490	20K
SR-03	720606	0800					41.0						
SR-03	720605	0830	(C)	720606	0800			1250	9.5		314.0		
SR-03	720606	1330										330	40
SR-03	720607	0735					39.0						
SR-03	720606	0800	(C)	720607	0735			1200	10.2		238.0		
SR-03	720607	0635	(C)	720607	0840							24000	1300
SR-03	720607	0935	(C)	720607	1125							7900	490
SR-03	720607	1230	(C)	720607	1430							13000	90
SR-03	720607	1530	(C)	720607	1730							18000	700
SR-03	720607	0735	(C)	720608	0740			1600	10.4		300.0		
SR-03	720608	0640	(C)	720608	0840							92000	4600
SR-03	720608	0935	(C)	720608	1125							35000	4900
SR-03	720608	1250	(C)	720608	1440							92000	7000
SR-03	720608	1535	(C)	720608	1735							240000L	1700
SR-03	720608	0740	(C)	720609	0755			1100	8.8		246.0		
SR-03	720609	0755	(C)	720610	0735			1400	9.4		314.0		
SR-03	720610	0735	(C)	720611	0645			1400	10.3		253.0		
SR-03	720611	0647	(C)	720611	0840							7000	1100
SR-03	720611	0940	(C)	720611	1140							7900	700
SR-03	720611	1410	(C)	720611	1610							160000	1700
SR-03	720611	1705	(C)	720611	1800							240000L	3200
SR-03	720611	0645	(C)	720612	0700			1000	8.3		230.0		
SR-03	720614	0700	(C)	720615	0700			1400	9.6				
SR-03	720615	0700	(C)	720616	0700				8.9		220.0		

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SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DATE	TIME	DEPTH	31615 FEC COLI MPNECMED /100ML	32240 TANNIN LIGNIN MG/L	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	50050 CONDUIT FLOW MGD	32730 PHENOLS UG/L	00545 RESIDUE SETTLBLE ML/L
SR-07	720605	1400				170						28.500		
SR-07	720605	0800	(C) 720606	0830			67	16.0	351	36	24	28.500		
SR-07	720606	0835										28.500	54	
SR-07	720606	1345				130						28.500		
SR-07	720606	0830	(C) 720607	0815						32	16	28.900		1K
SR-07	720607	0630	(C) 720607	0900		330						28.900		
SR-07	720607	1145										28.900	30	
SR-07	720607	0955	(C) 720607	1145		310						28.900		
SR-07	720607	1245	(C) 720607	1445		700						28.900		
SR-07	720607	1545	(C) 720607	1745		310						28.900		
SR-07	720607	0815	(C) 720608	0815			94		361	36	12	29.300		1K
SR-07	720608	0630	(C) 720608	0910		230						29.300		
SR-07	720608	1100										29.300	26	
SR-07	720608	1005	(C) 720608	1145		170						29.300		
SR-07	720608	1240	(C) 720608	1445		90						29.300		
SR-07	720608	1540	(C) 720608	1740		130						29.300		
SR-07	720608	0815	(C) 720609	0805				17.0		20	8	28.300		1K
SR-07	720609	0935										28.500	27	
SR-07	720610	0805										28.500	30	
SR-07	720609	0805	(C) 720610	0805			92	16.0	360	12	8	28.500		1K
SR-07	720611	0750											26	
SR-07	720610	0805	(C) 720611	0750				17.0		28	12	30.100		1K
SR-07	720611	0640	(C) 720611	0845		790						30.100		
SR-07	720611	0945	(C) 720611	1145		1300						30.100		
SR-07	720611	1415	(C) 720611	1615		90						30.100		
SR-07	720611	1805										30.100		
SR-07	720611	1710	(C) 720611	1805		70						30.100		
SR-07	720611	0750	(C) 720612	0805			63	19.0	360	24	12	29.300		1K
SR-07	720612	0806										29.300	20	
SR-07	720613	0805	(C) 720614	0805			62	17.0	353	22	15	27.600		
SR-07	720614	0805	(C) 720615	0810			67	16.0	352	10	8	27.200		
SR-07	720615	0810	(C) 720616	0740			67	20.0	328	18	10	28.500		

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PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00080 COLOR PT-CO UNITS	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML
SR-07	720605	1400				33.0								3900
SR-07	720605	0800(C)	720606	0830			1300	8.1	0.88	4.020	0.410		118.0	
SR-07	720606	0835				26.5								49000
SR-07	720606	1345												
SR-07	720607	0815				30.0								
SR-07	720606	0830(C)	720607	0815			1200	8.3	0.97		0.500	0.960	115.0	
SR-07	720607	0630(C)	720607	0900										17000
SR-07	720607	0955(C)	720607	1145										2200
SR-07	720607	1245(C)	720607	1445										54000
SR-07	720607	1545(C)	720607	1745										35000
SR-07	720607	0815(C)	720608	0815			1000	8.2	1.00	4.510	0.450	0.900	125.0	
SR-07	720608	0630(C)	720608	0910										35000
SR-07	720608	1005(C)	720608	1145										17000
SR-07	720608	1240(C)	720608	1445										24000
SR-07	720608	1540(C)	720608	1740										33000
SR-07	720608	0815(C)	720609	0805			900	7.9	1.15	4.350	0.550	0.830	125.0	
SR-07	720609	0805(C)	720610	0805			1200	8.2	1.05	4.100	0.550	0.820	125.0	
SR-07	720610	0805(C)	720611	0750			1100	8.2	1.33	4.200	0.550	0.860	120.0	
SR-07	720611	0640(C)	720611	0845										7900
SR-07	720611	0945(C)	720611	1145										11000
SR-07	720611	1415(C)	720611	1615										1700
SR-07	720611	1710(C)	720611	1805										1300
SR-07	720611	0750(C)	720612	0805			900	7.9	1.01	3.880	0.550	0.920	123.0	
SR-07	720613	0805(C)	720614	0805			1300	7.7	0.68	3.500	0.600	1.100		
SR-07	720614	0805(C)	720615	0810			1000	7.7			0.650	1.050	123.0	
SR-07	720615	0810(C)	720616	0740				7.7		3.500	0.750	1.050		

ORGANIC COMPOUNDS
ST. REGIS PAPER COMPANY
CANTONMENT, FLORIDA
- BEFORE TREATMENT -

Organic Compound	Chemical Class	Concentration mg/l	Chemical Formula	Solubility	Fish Toxicity mg/l	Taste & Odor
p-methoxy-phenol	phenol	0.044	$C_7H_8O_2$	mod. sol. in water	Killing strength for Perch 70 to 80 mg/l	Odor threshold for 30°C water is 0.002 mg/l[2/]
vanillin	an aldehyde & a phenol	0.77	$C_8H_3O_3$	slightly sol. in water	unknown	Odor threshold for water is 0.15 mg/l[2/]
acetovanillin	a ketone & a phenol	est. at 0.6-0.7[1/]	$C_9H_{10}O_3$	slightly sol. in water	unknown	unknown
syring-aldehyde	an aldehyde & a phenol	0.57	$C_9H_{10}O_4$	slightly sol. in water	unknown	unknown
Unknown compound similar to syring aldehyde est. at 0.6-0.7						
palmitic acid	fatty acid	0.14	$C_{16}H_{32}O_2$	insoluble in water	unknown	unknown
stearic acid	fatty acid	0.075	$C_{18}H_{36}O_2$	insoluble in water	unknown	unknown
oleic acid	fatty acid	0.56	$C_{18}H_{34}O_2$	insoluble in water	unknown	unknown
pimaric acid	resin acid	0.42	$C_{20}H_{30}O_2$	insoluble in water	unknown	unknown
dehydroabietic acid	resin acid	1.4	$C_{20}H_{28}O_2$	insoluble in water	unknown	unknown
abietic acid	resin acid	0.76	$C_{20}H_{30}O_2$	insoluble in water	unknown	unknown
neoabietic acid	resin acid	0.12	$C_{20}H_{30}O_2$	insoluble in water	unknown	unknown
beta-ocimene	terpene hydrocarbon	est. at 0.02-0.04	$C_{10}H_{16}$	unknown	unknown	unknown
beta-pinene	terpene hydrocarbon	est. at 0.02-0.04	$C_{10}H_{16}$	insoluble in water	unknown	unknown
fenchyl alcohol	alcohol	0.041	$C_{10}H_{18}O$	slightly soluble in water	unknown	unknown
camphor	ketone	0.014	$C_{10}H_{16}O$	insoluble in water	unknown	minimum detectable conc. that can be tasted 1.9 mg/l[2/]
borneol	alcohol	0.047	$C_{10}H_{18}O$	very slightly soluble in water	unknown	unknown
alpha-terpineol	alcohol	0.28	$C_{10}H_{18}O$	slightly soluble in water	unknown	unknown

There are also 5 unidentified compounds in the 0.2-0.8 mg/l range and about 8 other unidentified compounds in the 0.01-0.1 mg/l range

1/ Quantitative standard unavailable.

2/ California Water Quality Criteria, California Water Resources Control Board, Publ. 3-A, 2nd Ed. 1963.

ORGANIC COMPOUNDS
ST. REGIS PAPER COMPANY
CANTONMENT, FLORIDA
- EFFLUENT -

Organic Compound	Chemical Class	Concentration mg/l	Chemical Formula	Solubility	Fish Toxicity mg/l	Taste & Odor
oleic acid	fatty acid	0.077	$C_{18}H_{34}O_2$	Insoluble in water	unknown	unknown
stearic acid	fatty acid	0.026	$C_{18}H_{36}O_2$	Insoluble in water	unknown	unknown
palmitic acid	fatty acid	0.030	$C_{16}H_{32}O_2$	Insoluble in water	unknown	unknown
pimaric acid	resin acid	0.23	$C_{20}H_{30}O_2$	Insoluble in water	unknown	unknown
dehydroabietic acid	resin acid	0.51	$C_{20}H_{28}O_2$	Insoluble in water	unknown	unknown
abietic acid	resin acid	est. at 0.30 1/	$C_{20}H_{30}O_2$	Insoluble in water	unknown	unknown

several unidentified compounds - estimated concentration 0.05

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1/ Quantitative standard unavailable.

ORGANIC COMPOUNDS
BALDWIN POLE AND PILING COMPANY
BAY MINETTE, ALABAMA
- EFFLUENT -

Organic Compound	Chemical Class	Concentration mg/l	Chemical Formula	Solubility	Fish Toxicity mg/l	Taste & Odor
phenol	phenol	0.77	C_6H_6O	readily water soluble	13.5 mg/l 96 hr TLm for bluegills[2]	threshold conc. 0.02-0.03 mg/l[2]
o-cresol	phenol	1.4	$CH_3C_6H_4OH$	readily water soluble	24 mg/l 48 hr TLm for fathead minnows[2]	odor threshold at 30°C - 0.071 mg/l[2]
m-cresol	phenol	2.5	$CH_3C_6H_4OH$	readily water soluble	24.5 mg/l 24 hr TLm for carp[2]	odor threshold at 30°C - 0.33 mg/l[2]
2,5-xylenol	phenol	0.82	$(CH_3)_2C_6H_3OH$	readily water soluble	similar to 3,4 xylenol[2]	similar to phenol[2]
3,5-xylenol	phenol	1.5	$(CH_3)_2C_6H_3OH$	readily water soluble	53 mg/l - 24 hr TLm for carp[2]	similar to phenol[2]
3,4-xylenol	phenol	0.52	$(CH_3)_2C_6H_3OH$	readily water soluble	30 mg/l - 24 hr TLm for carp[2]	similar to phenol[2]
2-napthoic acid	aromatic carboxylic acid	0.16	$C_{10}H_7COOH$	water soluble	unknown	unknown
dehydroabietic acid	resin acid	0.024	$C_{20}H_{28}O_2$	insoluble in water	unknown	unknown
one isomer of dimethyl pyridine	pyridine	est. @ 0.1-0.2[1]	$(CH_3)_2C_5H_3N$	about 10 gm/ 100 gm water	unknown	unknown
2,4,6 trimethypyridine	pyridine	0.31	$(CH_3)_3C_5H_2N$	slightly soluble in water	unknown	unknown
quinoline	benzpyridine	1.5	$C_6H_4N{:}CHCH{:}CH$	readily soluble in water	5 mg/l was lethal to bluegills in 4 hr @ 13°C	unknown
two isomers of methyl quinoline	alkaloid	est. @ 0.5-0.6 for one & 0.05-0.06 for the other	$C_{10}H_9N$	slightly water soluble	unknown	unknown
two isomers of dimethyl quinolines	benzpyridine	both est. @ 0.05-0.06[1]	$(CH_3)_2C_9H_5N$	slightly water soluble	unknown	unknown
acenapthene	napthalene	0.20	$C_{10}H_6(CH_2)_2$	insoluble in water	unknown	unknown
dibenzofuran	furan	0.12	$C_6H_4OC_6H_4$	insoluble in water	unknown	unknown
fluorene	tricyclic aromatic hydrocarbon	0.17	$C_6H_4NHC_6H_4$	insoluble in water	unknown	unknown
diphenylene sulfide	aromatic sulfide	est. @ 0.05-0.01[1]	$C_{12}H_8S$	unknown	unknown	unknown
phenanthrene	tricyclic aromatic hydrocarbon	1.4	$C_{14}H_{10}$	insoluble in water	5 mg/l killed rainbow trout and bluegillee in 24 hrs	unknown
anthraquinone	tricyclic quinone	est. @ 0.04-0.06[1]	$C_6H_4{:}(CO)_2{:}C_6H_4$	insoluble in water	unknown	unknown
pyrene	tetracyclic aromatic hydrocarbon	0.33	$C_{16}H_{10}$	insoluble in water	unknown	unknown
fluoranthene	tetracyclic aromatic hydrocarbon	est. @ 0.5-0.7	$C_{16}H_{10}$	insoluble in water	unknown	unknown

1/ Quantitative standard unavailable.

2/ California Water Quality Criteria, California Water Resources Control Board, Publ. 3-A, 2nd Ed. 1963.

ORGANIC COMPOUNDS
TENNECO, INC.
BAY MINETTE, ALABAMA
EFFLUENT

Organic Compound	Chemical Class	Concentration mg/l	Chemical Formula	Solubility	Fish Toxicity mg/l	Taste & Odor
dehyroabietic acid	resin acid	0.1	$C_{20}H_{28}O_2$	insoluble in water	unknown	unknown
palmitic acid	fatty acid	0.38	$CH_3(CH_2)_{14}COOH$	insoluble in water	unknown	unknown
oleic acid	fatty acid	0.21	$CH_3(CH_2)_7CH = CH(CH_2)_7COOH$	insoluble in water	unknown	unknown

NOTE: There are 40-50 other organic compounds in this waste but most appear to be components of the oil found in the waste.

APPENDIX E

WATER QUALITY DATA

PERDIDO BAY AND TRIBUTARIES

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00080 COLOR PT-CO UNITS	00095 CNDUCTVY AT 25C MICROMHO	00300 DO MG/L	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L
PR-01	720606	1535			0002	25.0	40	225	8.6	6.6	0.01K	0.200	0.010K	0.040
PR-01	720607	1630			0001	26.0	30	37	8.5	7.4	0.03	0.360	0.050	0.040
PR-01	720608	1005			0001	24.5	35	45	7.8	7.3	0.01K	0.130	0.110	0.060
PR-01	720609	1435			0000	26.5	30	45	8.4	6.6	0.05	0.180	0.080	0.040
PR-01	720610	1120			0000	24.5	30	44	7.8	7.4	0.01K	0.200	0.090	0.120
PR-01	720611	1250			0000	24.0	35	39	8.2	7.2	0.05	0.140	0.140	0.040
PR-01	720612	1522			0000	25.0	30	180	8.5	6.6	0.01K	0.150	0.100	0.060
B-01	720606	1110			0001	25.0	30	475	4.8	6.9	0.02	0.320	0.700	0.690
B-01	720607	1400			0001	26.0	30	130	5.3	6.6	0.03	0.800	0.840	0.650
B-01	720608	0830			0001	25.0	35	65	4.8	6.5	0.01K	0.860	0.770	0.610
B-01	720609	1210			0000	28.0	30	100	4.6	6.7	0.01K	0.260	0.820	0.610
B-01	720610	0925			0000	25.5	35	97	4.7	6.6	0.01K	0.330	0.770	0.580
B-01	720611	1130			0000	24.5	50	65	4.3	5.7	0.08	0.330	0.690	0.440
B-01	720612	0930			0000	24.5	40	260	4.5	6.0	0.03	0.250	0.700	0.440

STATION	DATE	TIME	DATE	TIME	DEPTH	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML	32240 TANNIN LIGNIN MG/L	00310 BOD 5 DAY MG/L	00940 CHLORIDE CL MG/L	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L
PR-01	720606	1535			0002	3.0	790	50		0.6		50K	5K	5K
PR-01	720607	1630			0001	4.0	40	40		1.2			5K	5K
PR-01	720608	1005			0001	3.0	4900	790	0	1.7		50K	6	5K
PR-01	720609	1435			0000	2.0	1700	80		0.7			5K	5K
PR-01	720610	1120			0000	3.0	790	80	1	0.7		50K	24	8
PR-01	720611	1250			0000	2.0	790	170		1.2			12	5K
PR-01	720612	1522			0000	3.0	4900	80	1	0.6		50K	14	5K
B-01	720606	1110			0001	4.0	350000	170000		1.8	8.0		5K	5K
B-01	720607	1400			0001	4.0	7900	2300		1.3	8.0		6	6
B-01	720608	0830			0001	3.0	79000	800	0	0.7	7.0		5K	5K
B-01	720609	1210			0000	3.0	35000	1700		1.2	8.0		5K	5K
B-01	720610	0925			0000	3.0	7900	330	1	1.0	8.0		5	5K
B-01	720611	1130			0000	4.0	54000	2300		1.6	7.0		16	5K
B-01	720612	0930			0000	4.0	4900	790	0	0.9	7.0		16	5K

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00080 COLOR PT-CO UNITS	00300 DO MG/L	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L
EM-01	720606	1500			0000	33.0	1250	1.9	7.9				
EM-01	720607	1600			0000	35.0	1100	1.4	7.7				
EM-01	720608	0940			0000	30.0	900	1.5	7.6				
EM-01	720609	1415			0000	32.0	800	1.8	7.8				
EM-01	720610	1105			0000	30.0	1000	0.4	7.7				
EM-01	720611	1235			0000	32.0	1000	1.2	7.5				
EM-01	720612	1500			0000	32.5	1000	1.0	7.6				
EM-01	720614	0820			0000		1100		7.8				
EM-01	720615	0820			0000		1100		7.6				
EM-01	720616	0620			0000				7.6				
EM-02	720606	1435			0000	32.0	900	2.7	7.9				
EM-02	720607	1540			0000	35.0	900	1.8	7.8				
EM-02	720608	0920			0001	30.0	900	2.3	7.7				
EM-02	720609	1350			0000	31.0	800	2.0	7.8				
EM-02	720610	1050			0000	30.0	900	1.1	7.8				
EM-02	720611	1220			0000	32.0	900	1.6	7.5				
EM-02	720612	1445			0000	32.5	900	1.4	7.7				
EM-02	720614	0830			0000		900		7.6				
EM-02	720615	0830			0000		800		7.6				
EM-02	720616	0615			0000				7.6				

STATION	DATE	TIME	DATE	TIME	DEPTH	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML	32240 TANNIN LIGNIN MG/L	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L
EM-01	720606	1500			0000	118.0	17000	200	64	16.0	328	40	20
EM-01	720607	1600			0000	121.0	4900	50				20	5K
EM-01	720608	0940			0000	117.0	28000	700	88		341	26	6
EM-01	720609	1415			0000	132.0	92000	220		21.0		24	10
EM-01	720610	1105			0000	123.0	22000	220	87	16.0	335	20	8
EM-01	720611	1235			0000	107.0	4900	330		18.0		40	5K
EM-01	720612	1500			0000	130.0	7900	460	67	20.0	354	30	8
EM-01	720614	0820			0000	75.0			60	20.0	341	44	14
EM-01	720615	0820			0000	117.0			63	23.0	362	28	10
EM-01	720616	0620			0000	120.0			63	20.0	320	36	16
EM-02	720606	1435			0000	112.0	14000	200	59	12.0	314	40	12
EM-02	720607	1540			0000	134.0	4900	70				12	5K
EM-02	720608	0920			0001	111.0	22000	1700	81		306	22	6
EM-02	720609	1350			0000	114.0	2000	490		18.0		16	8
EM-02	720610	1050			0000	111.0	7900	20	81	16.0	316	52	24
EM-02	720611	1220			0000	90.0	3100	330		16.0		48	5K
EM-02	720612	1445			0000	111.0	11000	490	57	16.0	318	22	8
EM-02	720614	0830			0000	70.0			55	20.0	298	23	9
EM-02	720615	0830			0000	95.0			53	16.0	260	32	14
EM-02	720616	0615			0000	115.0			56	18.0	282	16	5K

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00080 COLOR PT-CO UNITS	00095 CNDUCTVY AT 25C MICROMHO	00300 DO MG/L	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L
EM-03	720606	1135			0000	28.0	700		3.4	7.9				
EM-03	720607	1415			0000	34.0	700		2.8	7.6				
EM-03	720608	0855			0000	25.5	600		2.6	7.6				
EM-03	720609	1140			0000	28.0	700		2.4	7.8				
EM-03	720610	0945			0000	27.0	700		1.8	7.7				
EM-03	720611	1110			0000	27.0	700		2.6	7.5				
EM-03	720612	0950			0000	26.5	600		2.4	7.4				
EM-03	720614	0845			0000		700			7.6				
EM-03	720615	0835			0000		800			7.5				
EM-03	720616	0600			0000					7.5				
EM-04	720606	1230			0001	28.0	700	3260	2.5	7.8	0.38	1.720	0.500	0.480
EM-04	720607	1450			0001	30.0	500	1370	0.0	7.4	0.42	1.820	0.700	0.530
EM-04	720608	1400			0001	31.5	700	2570	1.4	7.4	0.59	2.300	0.600	0.480
EM-04	720609	0740			0001	27.0	600	2500	0.8	7.7	0.53	1.820	0.600	0.460
EM-04	720610	1435			0001	28.0	650		0.9	7.8	0.60	1.870	0.550	0.410
EM-04	720611	1010			0001	26.0	400	2500	0.6	7.3	0.61	1.610	0.550	0.460
EM-04	720612	1055			0001	27.0	500	2200	0.4	7.4	0.68	1.710	0.500	0.430
EM-04	720613	1110			0001	27.5	650	3260		7.5	0.45	1.600	0.550	0.460

STATION	DATE	TIME	DATE	TIME	DEPTH	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML	32240 TANNIN LIGNIN MG/L	00310 BOD 5 DAY MG/L	00340 COD HI LEVEL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L
EM-03	720606	1135			0000	80.0	2400	20	47	12.0	233	28	20
EM-03	720607	1415			0000	88.0	330	170				12	SK
EM-03	720608	0855			0000	88.0	92000	330	60		237	20	6
EM-03	720609	1140			0000	69.0	7900	330		10.0		24	14
EM-03	720610	0945			0000	81.0	11000	490	62	14.0	240	44	20
EM-03	720611	1110			0000	65.0	1300	490		13.0		28	SK
EM-03	720612	0950			0000	90.0	14000	2800	42	11.0	231	36	SK
EM-03	720614	0845			0000	50.0			42	16.0	237	30	14
EM-03	720615	0835			0000	76.0			44	13.0	227	31	14
EM-03	720616	0600			0000	40.0			46	16.0		29	13
EM-04	720606	1230			0001	58.0	4900	50	41	8.3		12	12
EM-04	720607	1450			0001	68.0	1300	50				8	SK
EM-04	720608	1400			0001	65.0	3900	70	44			14	SK
EM-04	720609	0740			0001	65.0	92000	80		4.9		12	8
EM-04	720610	1435			0001	63.0	92000	130	34	5.6		12	SK
EM-04	720611	1010			0001	60.0	24000	330		5.0		20	8
EM-04	720612	1055			0001	65.0	2300	230	33	5.1		20	6
EM-04	720613	1110			0001	63.0	24000	110		10.0		18	10

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00080 COLOR PT-CO UNITS	00095 CNDUCTVY AT 25C MICROMHO	00300 DO MG/L	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L
P-01	720606	1300	0005	27.0	35	20300	6.5	7.4	0.01K	0.300	0.010K	0.030
P-01	720607	1505	0005	28.5	40	19900	3.1	7.7	0.01K	0.350	0.010K	0.040
P-01	720608	1420	0005	29.0	35	11400	8.2	8.1	0.01	0.230	0.010K	0.030
P-01	720609	1055	0005	28.0	25	11600	7.0	7.8	0.05	0.130	0.010K	0.030
P-01	720610	1627	0005	28.0	30	4800	8.3	7.8	0.04	0.170	0.020	0.020
P-01	720611	1023	0005	26.5	25	4200	7.5	6.5	0.03	0.200	0.010K	0.020
P-01	720612	1310	0005	27.5	20	7400	8.5	7.1	0.01K	0.140	0.010K	0.020
P-01	720613	1127	0005	27.0	20	5320	7.9	7.1	0.01K	0.130	0.010K	0.010
P-02	720609	0750	0002	28.0	90	16800	6.3	7.8	0.01K	0.130	0.050	0.050
P-02	720610	1440	0002	28.5	80	17200	6.6	8.0	0.05	0.230	0.020	0.060
P-02	720611	1000	0002	27.0	90	14300	6.0	7.1	0.06	0.400	0.070	0.060
P-02	720612	1050	0002	27.0	45	19000	6.5	7.5	0.08	0.160	0.010	0.040
P-02	720613	1100	0002	27.0	30	19600	6.8	7.8	0.01K	0.120	0.010K	0.040

STATION	DATE	TIME	DEPTH	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML	32240 TANNIN LIGNIN MG/L	00310 BOD 5 DAY MG/L	00940 CHLORIDE CL MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L
P-01	720606	1300	0005	4.0	490	20K		3.0		5K	5K
P-01	720607	1505	0005	5.0	20	20K		3.2		12	5K
P-01	720608	1420	0005	4.0	490	20K	1	3.4		6	5K
P-01	720609	1055	0005	4.0	330	20K		1.2		6	6
P-01	720610	1627	0005	3.0	1100	20	1	0.8		6	5K
P-01	720611	1023	0005		790	70		1.8		12	5K
P-01	720612	1310	0005	4.0	220	20K	0	1.4		16	5K
P-01	720613	1127	0005	3.0	170	20		1.1		14	5K
P-02	720609	0750	0002	9.0	1300	50	3	1.0	5850.0		
P-02	720610	1440	0002	6.0	4300	20	3	1.0	6150.0		
P-02	720611	1000	0002	9.0	170	20K	4	0.6	5450.0		
P-02	720612	1050	0002	7.0	490	20K	1	1.3	6300.0		
P-02	720613	1100	0002	7.0	60	20K	1	1.3	6500.0		

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SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

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STATION	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00080 COLOR PT-CO UNITS	00095 CNDUCTVY AT 25C MICROMHO	00300 DO MG/L	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L
P-03	720609	0820	0003	28.0	65	16400	6.8	8.0	0.01K	0.480
P-03	720610	1510	0003	28.5	65	18600	7.4	8.3	0.01K	0.200
P-03	720611	1005	0003	27.5	65	16500	6.3	7.8	0.01K	0.310
P-03	720612	1105	0003	26.5	35	19000	6.9	7.6	0.01K	0.230
P-03	720613	1108	0003	27.0	45	19400		7.9	0.01K	0.450
P-04	720609	0830	0003	28.0	50	18400	7.1	8.2	0.01K	0.190
P-04	720610	1500	0003	28.5	65	17900	6.9	8.3	0.01	0.200
P-04	720611	0840	0003	26.5	40	10400	7.1	7.7	0.01K	0.160
P-04	720612	1035	0003	27.0	40	20000	6.7	8.1	0.01K	0.280
P-04	720613	0905	0003	27.0	35	20900	6.8	7.9	0.01K	0.280

STATION	DATE	TIME	DEPTH	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML	32240 TANNIN LIGNIN MG/L
P-03	720609	0820	0003	0.010K	0.060	6.0	490	20K	2
P-03	720610	1510	0003	0.010K	0.050	7.0	110	20K	2
P-03	720611	1005	0003	0.010K	0.040	8.0	50	20	2
P-03	720612	1105	0003	0.010K	0.040	5.0	340	20K	1
P-03	720613	1108	0003	0.020	0.070	9.0	1700	20K	2
P-04	720609	0830	0003	0.010K	0.020	5.0	490	20	1
P-04	720610	1500	0003	0.030	0.040	7.0	790	20K	3
P-04	720611	0840	0003	0.010K	0.020	7.0	70	20K	1
P-04	720612	1035	0003	0.010K	0.050	7.0	1300	80	1
P-04	720613	0905	0003	0.010K	0.040	7.0	80	20	1

ENVIRONMENTAL PROTECTION AGENCY REGION IV
SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00080 COLOR PT-CO UNITS	00095 CNDUCTVY AT 25C MICROMHO	00300 DO MG/L	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L
P-05	720609	0800	0004	27.5	45	17?00	7.1	8.2	0.01K	0.200	0.010K
P-05	720610	1445	0004	28.5	70	?	7.5	8.4	0.03	0.200	0.030
P-05	720611	0955	0004	27.0	45		6.6	7.8	0.04	0.200	0.040
P-05	720612	1042	0004	26.5			6.7	8.1	0.01K	0.280	0.010K
P-05	720613	1050	0004	27.0		23600	6.6	8.0	0.01K	0.130	0.010K
P-06	720609	0840	0004	28.0	45	17500	7.0	8.2	0.01K	0.110	0.010K
P-06	720610	1515	0004	28.5	55	18100	7.1	8.4	0.01	0.230	0.010K
P-06	720611	0950	0004	26.5	65	17000	5.5	7.8	0.01K	0.200	0.020
P-06	720612	1115	0004	27.0	30	20700	6.9	8.0	0.01K	0.250	0.010K
P-06	720613	1045	0004	27.0	38	22000	6.7	7.9	0.01K	0.110	0.010K

STATION	DATE	TIME	DEPTH	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML	32240 TANNIN LIGNIN MG/L	00310 BOD 5 DAY MG/L	00940 CHLORIDE CL MG/L
P-05	720609	0800	0004	0.020	7.0	140	20	1	1.1	6300.0
P-05	720610	1445	0004	0.060	7.0	330	20K	2	1.6	6500.0
P-05	720611	0955	0004	0.040	9.0			2	2.3	6000.0
P-05	720612	1042	0004	0.060	8.0	790	20	1	1.3	6700.0
P-05	720613	1050	0004	0.040	6.0	330	70	1	1.2	7550.0
P-06	720609	0840	0004	0.050	7.0	20K	20K	1		
P-06	720610	1515	0004	0.040	7.0	490	20K	2		
P-06	720611	0950	0004	0.050	7.0	1300	20K	2		
P-06	720612	1115	0004	0.060	6.0	490	20	1		
P-06	720613	1045	0004	0.040	7.0	50	20K	1		

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SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00080 COLOR PT-CO UNITS	00095 CNDUCTVY AT 25C MICROMHO	00300 DO MG/L	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L
P-07	720609	0850	0003	28.0	45	18200	6.8	8.3	0.01K	0.100	0.010K
P-07	720610	1522	0003	28.5	45	18700	7.5	8.4	0.01K	0.250	0.010K
P-07	720611	0945	0003	26.5	50	18000	6.0	7.9	0.01K	0.300	0.030
P-07	720612	1120	0003	27.0	45	20700	7.0	8.0	0.01K	0.300	0.030
P-07	720613	1037	0003	27.0	35	21600	6.5	7.9	0.01K	0.180	0.010K
P-08	720609	0810	0004	27.5	45	18200	6.7	8.1	0.01K	0.260	0.010K
P-08	720610	1455	0004	28.5	55	18200	8.0	8.6	0.01	0.260	0.020
P-08	720611	0850	0004	27.0	40	19000	5.7	7.9	0.01K	0.200	0.010K
P-08	720612	1137	0004	27.0	30	23900	6.9	8.2	0.01K	0.230	0.010K
P-08	720613	0913	0004	26.5	36	22300	6.9	8.0	0.03	0.150	0.020

STATION	DATE	TIME	DEPTH	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML	32240 TANNIN LIGNIN MG/L	00310 BOD 5 DAY MG/L	00940 CHLORIDE CL MG/L
P-07	720609	0850	0003	0.030	6.0	80	20K	1	1.5	
P-07	720610	1522	0003	0.040	6.0	80	20	1	1.6	
P-07	720611	0945	0003	0.040	6.0	330	20K	1	0.8	
P-07	720612	1120	0003	0.060	7.0	40	20K	1	1.5	
P-07	720613	1037	0003	0.040	7.0	330	20K	1	1.4	
P-08	720609	0810	0004	0.030	7.0	130	20K	1		
P-08	720610	1455	0004	0.050	7.0	490	20	2		
P-08	720611	0850	0004	0.040	6.0	80	20K	1		
P-08	720612	1137	0004	0.040	6.0	50	20K	1		
P-08	720613	0913	0004	0.040	6.0	80	20K	1		

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SURVEILLANCE AND ANALYSIS DIVISION ATHENS, GEORGIA

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STATION	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00080 COLOR PT-CO UNITS	00095 CNDUCTVY AT 25C MICROMHO	00300 DO MG/L	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L
P-09	720609	0804	0004	28.0	40	21500	7.1	8.1	0.04	0.050	0.010K
P-09	720610	1450	0004	28.5	40	19200	7.5	8.5	0.01K	0.210	0.010K
P-09	720611	0930	0004	27.0	40	18800	7.0	7.9	0.01K	0.310	0.010K
P-09	720612	1132	0004	27.0	35	22700	6.9	8.1	0.01K	0.160	0.010K
P-09	720613	1022	0004	27.0	30	23900	7.0	8.0	0.01K	0.130	0.010K
P-10	720609	0900	0004	27.5	45	18100	6.9	8.1	0.01K	0.180	0.010K
P-10	720610	1527	0004	28.5	45	18100	7.2	8.5	0.01	0.120	0.010K
P-10	720611	0940	0004	27.0	35	18800	6.3	7.9	0.01K	0.260	0.010K
P-10	720612	1125	0004	27.0	35	23000	5.9	8.0	0.01K	0.300	0.010K
P-10	720613	1030	0004	26.0	32	23200	6.0	8.0	0.01K	0.260	0.010K

STATION	DATE	TIME	DEPTH	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML	32240 TANNIN LIGNIN MG/L	00310 BOD 5 DAY MG/L	00940 CHLORIDE CL MG/L
P-09	720609	0804	0004	0.020	15.0	70	20K	1	1.0	6800.0
P-09	720610	1450	0004	0.040	5.0	490	50	1	1.0	6750.0
P-09	720611	0930	0004	0.030	6.0	170	20K	1	0.8	6450.0
P-09	720612	1132	0004	0.040	5.0	170	110	1	1.1	7300.0
P-09	720613	1022	0004	0.030	6.0	20K	20K	1	1.0	7600.0
P-10	720609	0900	0004	0.040	6.0	330	20K	1		
P-10	720610	1527	0004	0.040	5.0	230	20	1		
P-10	720611	0940	0004	0.030	6.0	50	20K	1		
P-10	720612	1125	0004	0.050	5.0	170	20K	1		
P-10	720613	1030	0004	0.030	6.0	260	20K	1		

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PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00080 COLOR PT-CO UNITS	00095 CNDUCTVY AT 25C MICROMHO	00300 DO MG/L	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L
P-11	720609	0925	0004	28.5	35	21200	6.8	8.2	0.01K	0.200	0.010K
P-11	720610	1537	0004	28.5	40	18900	7.4	8.5	0.01	0.190	0.010K
P-11	720611	0853	0004	27.0	35	19900	6.4	8.0	0.04	0.230	0.020
P-11	720612	1145	0004	27.0	30	23400	7.1	8.2	0.01K	0.280	0.010K
P-11	720613	1007	0004	27.0	31	24500	6.8	8.2	0.01K	0.230	0.010K
P-12	720609	1030	0005	28.5	35	21000	7.0	8.4	0.01K	0.200	0.010K
P-12	720610	1540	0005	28.5	40	20800	9.0	8.9	0.05	0.180	0.020
P-12	720611	0857	0005	27.0	30	19700	6.6	8.0	0.01K	0.240	0.010K
P-12	720612	1150	0005	27.0	30	26100	7.4	8.5	0.01K	0.220	0.010K
P-12	720613	1000	0005	26.5	24	25100	7.2	8.4	0.01K	0.110	0.010K

STATION	DATE	TIME	DEPTH	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML	32240 TANNIN LIGNIN MG/L	00310 BOD 5 DAY MG/L	00940 CHLORIDE CL MG/L
P-11	720609	0925	0004	0.010	4.0	20	20K	1		
P-11	720610	1537	0004	0.030	5.0	700	170	1		
P-11	720611	0853	0004	0.030	5.0	20K	20K	1		
P-11	720612	1145	0004	0.030	6.0	20	20K	1		
P-11	720613	1007	0004	0.030	6.0	130	20K	1		
P-12	720609	1030	0005	0.010	5.0	20	20K	1	1.0	
P-12	720610	1540	0005	0.040	6.0	20	20K	2	2.4	
P-12	720611	0857	0005	0.030	5.0	80	20K	1	1.2	
P-12	720612	1150	0005	0.020	5.0	80	20K	1	1.2	
P-12	720613	1000	0005	0.020	6.0	20	20K	1	1.0	

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PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00080 COLOR PT-CO UNITS	00095 CNDUCTVY AT 25C MICROMHO	00300 DO MG/L	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L
P-13	720609	1040	0005	28.5	30	21000	7.0	8.4	0.01K	0.150	0.010K
P-13	720610	1547	0005	29.0	40	20600	8.6	8.9	0.03	0.190	0.020
P-13	720611	0902	0005	27.0	30	20600	6.7	8.2	0.01K	0.100	0.020
P-13	720612	1155	0005	27.0	30	27400	7.1	8.5	0.01K	0.220	0.010K
P-13	720613	0952	0005	26.5	27	26900	6.9	8.4	0.01K	0.290	0.010K
P-14	720609	0935	0005	28.5	25	23800	7.0	8.4	0.01K	0.150	0.010K
P-14	720610	1553	0005	29.0	30	21300	6.9	8.6	0.01K	0.200	0.010K
P-14	720611	0905	0005	27.0	30	22000	6.6	8.4	0.01K	0.240	0.010K
P-14	720612	1205	0005	27.0	30	26300	7.4	8.5	0.01K	0.230	0.010
P-14	720613	0945	0005	26.5	15	26800	7.2	8.4	0.01K	0.350	0.010K

STATION	DATE	TIME	DEPTH	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML	32240 TANNIN LIGNIN MG/L	00310 BOD 5 DAY MG/L	00940 CHLORIDE CL MG/L
P-13	720609	1040	0005	0.020	4.0	20	20K	1		
P-13	720610	1547	0005	0.050	6.0	20	20K	2		
P-13	720611	0902	0005	0.020	5.0	20K	20K	1		
P-13	720612	1155	0005	0.030	5.0	790	220	1		
P-13	720613	0952	0005	0.030	5.0	110	20	1		
P-14	720609	0935	0005	0.020	4.0	110	20K	1	1.3	
P-14	720610	1553	0005	0.040	5.0	50	20K	1	1.1	
P-14	720611	0905	0005	0.020	5.0	20	20K	1	1.1	
P-14	720612	1205	0005	0.020	4.0	330	170	1	1.0	
P-14	720613	0945	0005	0.020	5.0	40	20K	1	1.0	

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PERDIDO AREA FIELD STUDY (1972)

STATION	DATE	TIME	DEPTH	00010 WATER TEMP CENT	00080 COLOR PT-CO UNITS	00095 CNDUCTVY AT 25C MICROMHO	00300 DO MG/L	00403 LAB PH SU	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L
P-15	720609	0950	0005	28.0	25		6.8	8.5	0.01K	0.230
P-15	720610	1600	0005	29.0	25	23200	7.5	8.7	0.01K	0.230
P-15	720611	0910	0005	27.0	25	24900	6.8	8.4	0.01K	0.150
P-15	720612	1212	0005	27.0	25	27900	7.3	8.5	0.03K	0.220
P-15	720613	0927	0005	26.5	25	28200		8.5	0.01K	0.200
P-16	720609	0955	0005	28.0	20	28200	7.1	8.6	0.01K	0.200
P-16	720610	1605	0005	29.0	25	25900	6.8	8.7	0.01K	0.130
P-16	720611	0915	0005	27.0	20	25600	6.6	8.2	0.01K	0.100
P-16	720612	1220	0005	27.0	20	29200	7.4	8.6	0.01K	0.220
P-16	720613	0935	0005	26.5	20	28400		8.6	0.01	0.140

STATION	DATE	TIME	DEPTH	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-T P-WET MG/L	00680 T ORG C C MG/L	31505 TOT COLI MPN CONF /100ML	31615 FEC COLI MPNECMED /100ML	32240 TANNIN LIGNIN MG/L
P-15	720609	0950	0005	0.010K	0.010	4.0	20	20K	1
P-15	720610	1600	0005	0.010K	0.020	4.0	20	20K	1
P-15	720611	0910	0005	0.010K	0.010	4.0	20K	20K	1
P-15	720612	1212	0005	0.010K	0.020	5.0	130	50	1
P-15	720613	0927	0005	0.010K	0.020	5.0	80	20K	1
P-16	720609	0955	0005	0.010K	0.010K	4.0	20K	20K	0
P-16	720610	1605	0005	0.010K	0.040	4.0	20	20	0
P-16	720611	0915	0005	0.010K	0.010	4.0	330	130	1
P-16	720612	1220	0005	0.020	0.030	4.0	20K	20K	0
P-16	720613	0935	0005	0.010K	0.020	4.0	20K	20K	1